VOLUME 31 NUMBER

The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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COUNCIL ON DENTAL THERAPEUTICS ISSUE

JUNE 1, 1944

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Council on Dental Therapeutics, American Dental Association

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CONTRIBUTIONS TO HIGHER PROFESSIONAL STANDARDS—THE COUNCIL ON DENTAL THERAPEUTICS*

DONALD A. WALLACE,† Ph.D., Chicago, Ill.

THE Council on Dental Therapeutics protects the profession and the public against potentially dangerous, inferior or secretly formulated products and those which are not truthfully labeled or advertised. Prior to its organization, there was no impartial, professionally controlled agency to which the profession and the public could turn for information and guidance.

The Council, a standing committee of the American Dental Association, was organized in January of 1930 for the purpose of informing the dental profession and the public with regard to drugs, cosmetics, chemicals and pharmaceutic mixtures that are used in dentistry. The work of the Council has contributed significantly to the development of rational dental therapy. This influence continues to be observed, acting with increasing intensity. In October of 1943, the scope of the Council was enlarged to include such products as devices and physical therapy apparatus.

The Council is recognized by several governmental agencies, including the Food and Drug Administration and the Federal Trade Commission, as an authoritative source of information pertaining to subjects within its purview. It is frequently requested to assist these agencies in their important work. The Council also cooperates with the Council on Pharmacy and Chemistry, the Council on Foods and Nutrition and the Council on Physical Therapy, all of the American Medical Association.

Distributors of products that come within the purview of the Council are encouraged to present their products, their advertising and the evidence upon which claims are based. The products themselves are tested in the A.D.A. Bureau of Chemistry, and the evidence thus obtained, together with evidence presented by the firm, is evaluated by the Council. If the product is found to be acceptable, notice of acceptance is pub-

*Authorized for publication by the Council on Dental Therapeutics.

†Secretary of the Council on Dental Therapeutics and director of the A.D.A. Bureau of Chemistry.

lished in THE JOURNAL. If the product is not acceptable, but is of sufficient interest to warrant an informative article in THE JOURNAL, the publication of such an article is authorized.

If the distributor does not present his product for consideration, samples of the product and its advertising may be collected by the Council on its own initiative. This is usually done only when such action is clearly in the interest of the profession and the public. A report is prepared on such products and is published if the findings of the Council warrant its publication.

Each year, the Council publishes a book entitled Accepted Dental Remedies.* This book contains a list of approximately 600 accepted products, together with their formulas, properties, actions, uses and dosages and much general informative material, the official rules of the Council, an index to reports on products that are not accepted by the Council and a collection of formulas and prescribing suggestions. A list of accepted products appears under the Council on Dental Therapeutics in this issue of THE JOURNAL.

The Council authorizes for publication in its section of THE JOURNAL articles, usually of a review character, that are written at its request with the object of summarizing the current status of products or methods of treatment. Examples of such articles appearing within the last year are:

"Vinyl Ether (Vinethene)." Earl A. Zaus, B.S., M.D.

"Endocrines and Dentistry." Isaac Schour, D.D.S., Ph.D., D.Sc., and Maury Massler, D.D.S., M.S.

"Dentifrices." (A Council report.)

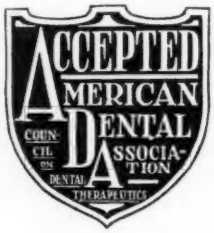
"The Business Management of Dental Meetings in the Light of Declining Revenues from Commercial Sources." John J. Hollister.

"Practical Significance of Abrasives in Dentifrices." Sidney Epstein, D.D.S.

"Systemic Aspects of Diseases of the Teeth and Oral Tissues." Lester W. Burket, D.D.S., M.D.

Each year, the Council requests from the governing bodies of the Association sufficient funds to defray the expenses of a few scientific investigations. Grants made by the Council are small and are intended to pay only for materials and a small amount of technical assistance. It is often possible to induce a very capable investigator to work on problems of special importance to dentistry if such a grant can be made to him.

The Seal of Acceptance, which is reproduced here, may be used on packages and in the advertising of products that are accepted by the Council. The Council does not *require* that the Seal be displayed except on the packages of accepted dentifrices, where the public needs the Seal as a purchasing guide. An exception to the latter requirement is made in the case of products which may be used as dentifrices, but which are more commonly used for other purposes; for example, baking soda.



The Bureau of Chemistry of the American Dental Association is operated in conjunction with the office of the Council. Its director is the secretary of the Council. J. Roy Doty, Ph.D., in chemistry, and formerly a member of the faculty of the Louisiana State University School of Medicine, devotes full time to work in the Bureau. This work consists primarily in the development of testing methods and their application to the dental products

*Chicago: American Dental Association, 304 pages; price $1.

that come within the scope of the Council. All accepted products are examined routinely at suitable intervals. Such tests of other products are made as appear to be in the interest of the profession and the public.

Such products as Emedent Pyorrhea Treatment,[1] which was found to be a 41 per cent aqueous solution of sulfuric acid, and Dr. Bell's Guaranteed Pyorrhea Remedy,[2] which was found to consist essentially of pumicite and alum, were among the first nostrums exposed by the Council and the A.D.A. Bureau of Chemistry. Each of these products was priced at $10 per retail package. Largely as a result of the Council's activities, such products are not found on the market in America today.

While the use of some of the worst nostrums has been abandoned by the profession since the formation of the Council, there are still on the market many products the use of which, in the light of currently available information, is not in the best interest of the profession and the public.

The Council considers that it is not necessary or desirable that local anesthetic solutions that are more potent and more toxic than 2 per cent procaine be used routinely in dentistry. Since the availability of such solutions in ready-prepared form tends to encourage their routine use, no such preparations have been accepted by the Council. Among those currently marketed that are considered to be too toxic for routine use are a 1.5 per cent solution of Monocaine (Novocol Chemical Mfg. Co., Inc.), Novocain-Pontocaine with Cobefrin (Cook-Waite Laboratories)[3] and 4 per cent solutions of procaine.[4]

The Council has recently been authorized to consider devices and physical therapy apparatus. One of its first decisions with respect to such products dealt with the ultraviolet lamps that have recently been advertised to the dental profession for disinfecting the air in dental offices and waiting rooms. The Council voted, at its recent annual meeting, that ultraviolet disinfecting lamps as presently promoted for use in dental practice be declared unacceptable.

The current advertising for certain unaccepted dentifrices and mouth washes tends to encourage the public to rely upon them for prevention or cure of disease, particularly caries and periodontal disorders. This advertising is not substantiated in fact and is therefore contrary to the public interest, in the opinion of the Council.

Patients sometimes ask their dentist why the dentifrice they are using is not accepted. Such persons may be told that the composition of unaccepted dentifrices is not usually made known to the profession or the public and that the composition is subject to change without notice to any official or professional body. Some unaccepted dentifrices have been found to contain substances that may be potentially harmful or irritating. Others are marketed with advertising claims that tend to cause the public to rely upon them to prevent or cure disease or are otherwise false or misleading. Since the composition of such products is not usually known to the Council or the dentist and is subject to change at any time, it is difficult to criticize them specifically. However, it is obvious that accepted dentifrices are much safer, since the distributors or manufacturers of accepted dentifrices are required to keep the Council informed of changes in the composition of their products and the Council is in a position to keep the profession and the public informed. The requirements of the Council are sufficiently strict to make it unlikely that an unreliable dentifrice will stay on the accepted list very long.

Patients often ask about mouth washes. The Council does not accept mouth washes that are intended for indiscriminate use by the laity. The routine use of medicated mouth washes by the laity has

not been shown to serve any useful purpose. Mouth washes that are intended to exert a therapeutic effect should be used only under the supervision of a dentist or a physician.

The Council informs the dentist of trends in therapeutics, and it offers him a list of accepted products from which he may select those that he prefers. By using the services of the Council, the dentist may protect himself and his patients against the effects of inadequately investigated or potentially harmful preparations. The dentist who uses or prescribes unaccepted products would be in a relatively weak position if he should be accused of malpractice. He will save time and protect his patients if he refuses to use unaccepted products.

To cooperate with the Council, every dentist should use only accepted products in his practice and recommend or prescribe only accepted products for his patients. In case of doubt concerning the acceptability of any preparation that comes within the purview of the Council, an inquiry addressed to the Secretary of the Council on Dental Therapeutics, 222 E. Superior Street, Chicago 11, Ill., will bring a prompt and informative reply.

The members of the Council have been selected with regard to their special abilities, integrity and fearlessness. Of the twelve members, six are dentists and six are men who are eminently qualified in the preclinical sciences. None of these men receives a salary from the American Dental Association. The Secretary of the Association and the Editor of THE JOURNAL are ex-officio members. The members are as follows:

J. Howard Brown, Ph.D., Sc.D., Associate Professor of Bacteriology, Johns Hopkins University, Baltimore, Md.

Edward C. Dobbs, D.D.S., Associate Professor of Pharmacology and Therapeutics, University of Maryland School of Dentistry, Baltimore, Md.

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Milan A. Logan, Ph.D., Professor of Biochemistry, University of Cincinnati, School of Medicine, Cincinnati, Ohio.

Arno B. Luckhardt, M.D., Ph.D., Sc.D., LL.D., Professor of Physiology, University of Chicago, Chicago, Ill.

Harry Lyons, D.D.S., Professor of Oral Pathology and Therapeutics, and Periodontia, Medical College of Virginia School of Dentistry, Richmond, Va.

H. Berton McCauley, D.D.S., Assistant Professor of Dentistry, University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

Victor C. Myers, Ph.D., Sc.D., Professor of Biochemistry, Western Reserve University, Schools of Medicine and Dentistry, Cleveland, Ohio.

Floyd D. Ostrander, D.D.S., M.S., Assistant Professor of Dentistry (in charge of materia medica and therapeutics), School of Dentistry, University of Michigan, Ann Arbor, Mich.

Charles Sheard, Ph.D., Sc.D., Professor of Biophysics, The Mayo Foundation, University of Minnesota and Director of the Division of Biophysical Research, The Mayo Clinic, Rochester, Minn.

Harold S. Smith, D.D.S., Chairman of the Council, 180 North Michigan Ave., Chicago, Ill.

The Council frequently seeks the advice of carefully chosen consultants.

BIBLIOGRAPHY

1. Emedent. J.A.D.A., 17:1945, October 1930.

2. Dr. Bell's Guaranteed Pyorrhea Remedy. J.A.D.A., 19:143, January 1932.

3. Preliminary Report on Novocain-Pontocaine-Cobefrin Solution-R. B. Waite. J.A.D.A., 29:2247, December 1, 1942.

4. Four Per Cent Procaine Solutions—Not Acceptable for A.D.R. J.A.D.A., 31:278, February 1, 1944.

THE SHAPE OF THINGS TO COME

HAROLD HILLENBRAND,* D.D.S., Chicago, Ill.

THE shape of things to come may be determined in several ways. The shape of things to come may be determined by the overwhelming pressure of a single catastrophic force, as the eruption of Vesuvius determined the fate of the little town of Pompeii that clung to its sides centuries ago.

The shape of things to come may be determined by the continued attack of numberless little forces, as the shape of the Grand Canyon was determined by the relentless tongues of hungry rivers.

The shape of things to come may be determined by the ideals and principles, the visions and hopes of men's minds, as the pattern of freedom in this country was determined by the men who wrote the Constitution.

Thus, the shape of things to come in dentistry will be determined in much the same ways: Defeat in the present war will change dentistry roughly and drastically; the countless little problems now seeking attention will change the shape of dentistry depending on whether they grow or diminish; the ideals and hopes, the principles and visions of the leaders in dentistry today will exert still another influence on the shape of things to come.

I shall undertake this afternoon—not prophecy, for James Russell Lowell has said ungrammatically, but correctly: "Don't never prophecy onless ye know"—I shall undertake to place before you some of the "countless little problems now seeking attention in dentistry." To this information each of you must add his personal opinions, his social philosophy, his political outlook, his willingness to work and plan against the future, his ideals and hopes for Dentistry in the world at peace. If each of you do this, you will have, not my conception of the postwar world, but your own conception, made of your own premises, opinions and conclusions. And if enough dentists ultimately reach the same end-results, then dentistry will have the convictions that are the basis of action.

It seems to me that there are four great fronts on which the battle for the future is now being waged. These fronts are made up of the problems which have to do with (1) current proposals for greater social security; (2) the manpower of the dental profession; (3) the public health aspects of dentistry, and (4) the organization of the dental profession. In order to get the information necessary to make up our minds on the shape of things to come, it may be worth while to explore these four fronts of present-day problems.

I. CURRENT PROPOSALS FOR SOCIAL SECURITY

War is a time of slogans, not all of which stand the tests of realism and peace. But there can be little doubt that one of the basic objectives the democracies hope to win out of this war—out of its suffering, sacrifice, bloodshed and death—is greater security for all peoples. It would be difficult to be entirely wrong about this estimate because signs multiply daily that people in all parts of the world are thinking of victory in terms of greater security.

Read at the annual meeting of the Ohio State Dental Society, Cleveland, Ohio, November 8, 1943.

*Assistant Editor of the Mid-Monthly Edition of THE JOURNAL.

Atlantic Charter.—As international evidence of the trend toward greater security, there is the Atlantic Charter, enunciated in 1941, which states that the United Nations "desire to bring about the fullest collaboration between all nations . . . with the object of securing for all . . . economic adjustments and social security."

Australia and New Zealand.—In Australia and New Zealand, the respective governments are now considering the introduction of a "salaried medical service" which would eventually place the health professions fully and directly under the control of the state. These are two of the more radical proposals in the field of social security, for they would ultimately produce what we know as "state medicine" or "state dentistry."

Great Britain.—In Great Britain, the trend toward social security is attested by the publication a year ago of the monumental Beveridge report on "Social Insurance and Allied Services." At the risk of doing an injustice to the 300-page report of Sir William, let me attempt a summary in two sentences. The Beveridge report proposes: (1) to expand the British social security system to include all members of all classes without regard to income and (2) to centralize control of this vast social security system in the central government.

The Beveridge program is more inclusive and more radical than any that has yet been proposed in this country, but there is also considerable evidence that the report is being used as a basis of long-range planning for this country. If the latter is true, it is of interest to examine the proposals for dentistry.

Under the present system in England, very little dentistry is practiced under health insurance. Indeed, dental benefits are provided only when the insuring agency has made enough profits to declare a dividend of dental benefits. To remedy this deficiency in the system of health care, Beveridge makes the following five proposals:

1. Preventive dental care is essential to the health of the nation. 2. The program will include dental health education, with emphasis on early and periodic visits to the dentist. 3. Dental benefits will be provided as are medical benefits and will be just as complete. 4. If the demand for dental care is stimulated, the present supply of dentists will not be able to meet it. 5. When dental appliances, such as dentures, are supplied, the patient should bear a part of the initial cost.

With one possible exception, these statements will produce no controversy with dentists in this country. On the methods by which these objectives are to be achieved, there will be, of course, considerable argument and discussion. Nevertheless, the Beveridge report—one of the great social documents of our time—makes more enlightened proposals for dentistry than many programs in this country have done.

Here, each of you must answer these questions for yourself: Will the Beveridge report be adopted? Will it have an influence on social security proposals in this country? Does the report forecast a real trend in social security, or is it being used as wartime propaganda?

Canada.—In Canada, we are much closer home. In that country, too, there has been a monumental study of social security, the results of which are embodied in the Marsh report. The Canadian parliament, as a result of that study, is now considering the establishment of a national system of compulsory health insurance. The Canadian Dental Association, which participated in the study, has requested "the establishment of a compulsory dental health insurance scheme for all children up to the age 16," with provisions for extension as soon as feasible. Under this compulsory program, the following types of dental service would be provided: semi-annual

examinations, prophylactic treatments, plastic fillings, extractions, anesthesia, radiography and special services, with special materials. In addition, the Canadian government has been asked by the Association to furnish grants of money for dental research, dental health education and the education of students in dentistry.

There, we have a compulsory dental health insurance scheme providing rather complete dental benefits, proposed by the official Canadian Dental Association. Recent polls indicate that "seven out of every ten Canadians are in favor of a contributory national health plan" and that two-thirds of the present members of parliament are in favor of a health insurance plan.

The questions to be asked here are: How far does the Canadian situation professionally and politically, parallel that of this country? Will this attempt at full cooperation by Dentistry with Government result in an equitable program? Is it the first step to ultimate Government control? Is the Canadian program of compulsory dental care for children the best approach to the problem of greater dental security? Is the Candian plan a forecast of the shape of things to come in this country?

United States.—Now we come directly to the proposals for social security in this country. We shall consider the four that have some importance for Dentistry, but there are, of course, many others.

1. *NRPB Report.*—Shortly after the Beveridge plan was announced in England, the report of the National Resources Planning Board (NRPB) was published in this country. This report is popularly known as the American Beveridge plan or as the "cradle to the grave program." It is nothing of the sort. It is general where the Beveridge plan is specific; it is idealistic where the Beveridge plan is realistic.

Shortly after the report was published, Congress refused to appropriate any more funds for the NRPB, for two apparent reasons: (1) Congress didn't like the report. (2) Congress didn't like the President's uncle who was chairman of the Board. It is also interesting to note that Dr. Eveline Burns, the author of the health section in the NRPB report, is a former student of Sir William Beveridge, and it is reasonable to suppose shares with him a large number of basic social viewpoints.

The NRPB report does not make a proposal for a health insurance system, but it does propose "adequate medical and health care for all regardless of place of residence or income status." The report has importance because (1) it indicates that this government is also planning for increased social security and (2) it will probably be used as the basis for postwar planning in this country despite its present unpopularity.

2. *The Hyser Plan.*—Even such weighty discussions as this must have their lighter moments, and that is one of the reasons why I am going to say a few words about the Hyser plan. This queer and ill-fated adventure into Alice-in-Wonderland planning caused a needless stir when its Rube Goldberg methods for producing dentistry on a belt line were revealed at a hearing before a Congressional committee. Needless to say, the Hyser plan as a sound proposal for making more dental care available has a colossal and magnificent unimportance. Its only merit is that it has pointed out sharply that even such Walt Disney conceptions of dental practice can win attention from uninformed enthusiasts and thus interfere with more sensible planning for the postwar era in dentistry.

3. *Dentistry for Veterans.*—There is now pending in the Congress a bill which would make any veteran of this war eligible to receive dental prosthetic appliances without charge through the Vet-

erans' Administration. It is not the point here to debate the wisdom of the bill, but merely to demonstrate that this is another effort at increased security—this time, dental security. The group to be covered would be composed of ten million men who will soon constitute a large bulk of the wage and salary earners in this country. Its passage would have an immediate and undeniable effect on the shape of things to come in Dentistry.

4. *The Wagner Health Bill.*—The most important trend toward increased social security in this country is epitomized in the Wagner-Murray-Dingell bill (S. 1161) now pending before the Senate. This bill, basically, proposes to expand the social security act. In its eighty pages of legal terminology will be found the following three points:

1. The Wagner Bill proposes to extend the Social Security Act and widen its coverage in many directions so that, for example, dentists will come under the old age provisions of the Act.

2. It proposes a system of compulsory health insurance under the direction of the Surgeon General of the United States Public Health Service.

3. Dentistry is not included in this insurance system, but the bill provides for dentistry in the following special and peculiar manner: The Surgeon General is ordered to study ways and means of providing dental benefits for a period of two years. At the end of that period, he will report to the President, and the report, presumably, will be used as a basis for including dentistry in the compulsory health insurance scheme.

To some, the last provision may seem desirable because it apparently postpones Dentistry's day of reckoning until two years have elapsed and the pattern for Medicine has been worked out. But is it reasonable to suppose that, after the medical pattern is determined, the dental pattern will not follow it willy-nilly? This has always been the case in the past and it is optimism to hope for a change in the future.

Is it not wiser to recognize the special provision for dentistry for what it might be: (1) a confession of present inability to supply dental benefits for financial or other reasons; (2) a refusal to recognize that Dentistry must be an integral part of any national health service worthy of the name, and (3) an attempt to divide Medicine and Dentistry in their attitude toward the bill?

At the recent meeting of the American Dental Association in Cincinnati, the House of Delegates voted to oppose the bill because it did not conform to the eight principles established to protect the interests of the public and of the profession in any national health program.

The following questions, however, are of importance in evaluating the Wagner bill: Is the bill going to pass in its present form? Is Dentistry's position in the bill desirable or undesirable? Is organized Dentistry willing, and strong enough, to fight the bill successfully or to make needed changes? Is the Wagner bill the pattern for the type of health service program that government desires?

Here, I think we can risk the conclusion that there is a national and international trend toward social security; that dentistry as an authentic health service will play a part in any expanded social security program.

II. MANPOWER PROBLEMS IN DENTISTRY

The second great front on which the problems of the future are being fought is the manpower of the dental profession. Here, at least four problems, largely interrelated, will have an influence on the shape of things to come.

1. *Number of Dentists.*—There are, roughly, 70,000 dentists in the country, with 17,000 or 24.3 per cent, in military service. As all of you know, there is an acute shortage of dentists in civilian life at the present time, and it is a practical

impossibility to launch any great program for expanded dental care because there simply are not enough dentists. Even in times of peace, many counties in this country had a dentist:patient ratio well above the 1:2,500 that is considered necessary for adequate care.

This means, as Beveridge stated in his report for England, that any expansion of the dental program in this country must be accompanied by the production of more persons who can provide dental care. The last sentence was phrased in that way because this can be done in at least two ways: (1) by graduating more dental students and (2) by enlisting the aid of lesser trained groups, such as technicians and hygienists, to provide certain types of dental care on a wider and more effective scale.

If these are the only two alternatives, I would declare immediately for not lowering the standards of dental practice by any admission of those with less than full dental training. But other questions must be answered if we are to know the shape of things to come: Where are the dentists coming from to handle a vast national dental program? How are they going to be trained? What are the places of the hygienist and the technician in this program? Is a program of vocational guidance to enroll more dental students needed by the profession? Is it wise to oppose any expansion of the dental program on the ground that there is not sufficient trained personnel? Will this argument eventually lead to the double standard in training dentists?

2. *Control of Dental Education by the Military.*—This problem ties in directly with the present control of dental schools by the military. So long as that continues, there is no chance of expanding the profession's personnel because enrollment in dental schools is practically frozen at present levels. This means that Dentistry will confront the postwar period with a predictable shortage of dentists to meet existing needs, to say nothing of an expanded dental program.

For the duration of the war, the military have reserved 55 per cent of all available places in the dental schools in order to recruit personnel for the armed forces. Thus, there will be fewer graduates annually for civilian dentistry and, in addition, there will be the continued withdrawal of dentists in that category by the armed forces. If control of dental education is not yielded by the military before the end of the war, we can be sure that one of the profession's most trying problems will be a drastic shortage of manpower.

3. *Training of Dental Technicians.*—There has also been a shortage of dentists in the armed forces. Because of the abolition of dental requirements for inductees, many extensive prosthetic restorations have had to be constructed. Both the Army and the Navy have extended their supply of dentists by training dental technicians for the prosthetic laboratory by the hundreds.

Will these technicians return to their former occupations after the war? Will they attempt to utilize their new skills in the commercial laboratories? Will certain groups not use the argument that this army of technicians be used to overcome the shortage of dentists?

4. *Relocation and Distribution of Dentists.*—After the war, there will be the task of relocating and distributing 20,000 dentists, perhaps in the face of an equipment shortage. Even in peace times, the distribution of dentists in this country was highly unsatisfactory and one of the basic problems in any national dental program. In time of war, this unsatisfactory distribution of dentists, as well as of physicians, has reached the point that funds have been appropriated by the Congress to the United States Public Health Service to relocate dentists, on a voluntary basis, in so-called critical areas. More than one threat has been made to do this on a compulsory basis.

If the urgency of war should dictate

the passage of such legislation, then the shape of things to come after the war will be greatly influenced and Government will have a most powerful weapon over returning dentists in the interests of federalized dental practice.

III. DENTISTRY'S PUBLIC HEALTH PROBLEMS

Dentistry's rôle in the present war brings proof—if proof is needed—that dentistry is an integral part of any effective health service. And it is here that we find the third great front.

United States Public Health Service.—The United States Public Health Service is the official public health agency for the federal government. Its dental record for past generations is poor. Only recently, in dental research, has it begun to move toward the place that it should occupy so far as the dental profession is concerned. In other fields of Dentistry, its record demonstrates lack of authority, lack of personnel, lack of leadership and initiative and, unfortunately, lack of courage to ask for Dentistry's proper share in the foremost national agency for health.

This is certainly not solely the fault of the dental personnel of the Public Health Service, which, as an organization, labors under antiquated legislation, red tape, sacred cows and careerism. The fact remains, however, that, even though another reorganization is pending, the Service makes no concessions to dentistry that have not been fought for and none that make its future progress a foregone conclusion.

The Wagner Health Bill proposes to place a national health program under the direction of this agency. Unless that Service is improved by reorganization beyond the point that now seems possible, Dentistry, on past performances, cannot look with anything but misgiving on such an action. A good effort to control the shape of things to come will take the form of initiating a vigorous dental program in the U. S. Public Health Service.

Public Health Dentistry in the States.—The position of public health dentistry in the states is little better, though there are many encouraging signs of initiative, leadership and vision. At the present, only forty-two states have full-time positions for dentists in the state departments of health and, of these, seven are vacant.

If Dentistry is at all anxious to avoid what is loosely called socialization, the best way to do it is to have strong state and local programs, for these are the best antidote to federal interference. Dentistry must therefore train more public health dentists and place them in strong state and local positions where local, and not federal, decisions guide the programs. If states and communities—state and local dental societies—continue to ignore the value of public health dental programs, then in the postwar period there will certainly be a hue and cry for federal intervention to provide services that are not being provided locally.

Public Health Methods.—The profession's attitude toward public health problems becomes even more important when we consider that the first public health approach to the specific prevention of dental diseases may be very near. The recent work on the fluorine content of public water supplies is most encouraging. If this method is found by continuing research to be effective, then postwar Dentistry will have in its hands its most powerful weapon to date for the control of dental caries. This means that postwar Dentistry will be forced to seek greater public health programs, personnel and funds.

IV. PROBLEMS IN DENTAL ORGANIZATION

The fourth, and final, scene of action in the struggle for the future will be in dental organization. The dental society, on national, state and local levels, can be the most effective agency for safeguarding developments in the postwar period. These developments will depend largely on how enthusiastically, how

forcefully and how effectively dental societies are organized to meet the problems of the moment.

A.M.A. Decision.—The decision of the U. S. Supreme Court in holding the American Medical Association guilty of conspiracy to violate the Sherman Anti-Trust Act is of interest in this connection because it provides Government with an effective means of controlling the activities of professional societies. If this decision is amplified in the postwar period, then dental societies on every level may have to develop new policies and methods for handling their problems.

Councils on Dental Health.—The position of Dentistry in the postwar world will depend largely on how intelligently and how vigorously dental societies plan against the future. One of the most encouraging signs in this direction is the establishment of councils on dental health on the national, state and local levels. If these councils can be activated to exercise leadership in the state and community, postwar Dentistry will have an effective mechanism for combating unwanted federalization. The national Council on Dental Health, of course, must provide an equally vigorous leadership on the national front. The present program of the Council can achieve this end, but only if it has the unstinted support of the constituent and component societies.

The councils are the means of keeping the professions alert and informed, and if that task is done successfully, no dentist and no dental society need fear the shape of things to come.

These, then, are the factors that will influence the shape of things to come: (1) the direction and extent of the present trend in social security; (2) the way in which Dentistry meets its manpower problem; (3) the development and use of better public health programs in dentistry, and (4) the rôles that organized dental societies will take in planning for the future.

In them lie the answers to all questions about the postwar period. In them lies more than prophecy about the shape of things to come. In them lies the development of Dentistry, as a profession and as an authentic health service, for many years to come. In them lies the hope of fulfilment of the dreams of men who made Dentistry and who made it great.

But the shaping of Dentistry is not alone the task of others. It is the work of every man who calls himself dentist. It is his job to know the facts in these problems. It is his job to know what he thinks and wants in these problems. It is his job to reinforce his own wishes and work through the use of organized dental societies. It is his job to provide professional leadership so that no program inimical to the best interests of the public and the profession is imposed on dentistry. It is his job—by vision, ideals, principles and hard work—to translate his programs into action. Only then will Dentistry maintain her place as an integral part of that service which brings health to the people of the nation. Only then will Dentistry prove again that she can and will serve the nation not only in times of war, but in days of ultimate victory and peace as well.

SULFONAMIDE DRUGS AS AN ADJUNCT IN HANDLING DENTAL INFECTIONS

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THE sulfonamide drugs were first used in dentistry approximately six years ago. Dentists began to experiment with sulfanilamide applied locally after extraction. No spectacular results were forthcoming and many practitioners gave up the use of the drug entirely. In the intervening years, however, much has been learned about the dosage, effect upon specific organisms and, more recently, the local application of the drugs to both clean and infected wounds. The facts thus far definitely prove the value of the sulfonamides as an aid, both in the control of infected wounds and after surgical procedures.

If the drugs are to be used in the routine practice of dentistry, and I believe that they should be, the dentist must have a better understanding of the dosage, application to certain conditions and the toxic manifestations of these drugs.

In this paper, an attempt has been made to summarize the uses of the sulfonamide drugs as they pertain to dentistry and to enumerate the toxic manifestations that we must guard against and be able to recognize. Dosage *per os* has also been included for treatment of the more common infections with which the dentist finds himself concerned.

ACTION OF THE DRUGS

The exact method by which the sulfonamide compounds act on the various susceptible bacteria is still uncertain. The results of experimental investigation seem to indicate that these compounds interfere with the functioning of certain enzyme systems essential to the multiplication or survival of bacteria.[13] From this, we see that if a sulfonamide drug is present in the tissues in relatively low concentration, as is true in most instances when it is administered by mouth, the multiplication of susceptible bacteria is decreased (bacteriostatic effect), and if the drug is present in high concentration, as in the local application, an actual bactericidal effect will be noted on susceptible organisms.

Along with this primary or direct effect of the sulfonamide drugs on certain micro-organisms, a secondary effect plays a part in ridding the individual of invading bacteria; namely, phagocytosis. This process has been noted especially in the instance of infection by the hemolytic streptococcus.[13] Phagocytosis plays an important part in bringing about complete elimination of the infection. How important phagocytic action is in other infections that are less susceptible to sulfonamide therapy has not been established.

Laboratory tests have proved that certain substances present in the tissues or locality may act as inhibitors of the bacteriostatic and bactericidal effects of the sulfonamides. Recently, it has been shown that para-aminobenzoic acid, a simple organic chemical isolated from yeast, possesses marked antisulfonamide effects and can neutralize relatively large amounts of the different sulfonamides. This observation is especially important to the dentist when we realize that procaine is an ester of para-aminobenzoic acid and breaks down in part to

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the parent substance after injection into the tissues. The presence of pus and necrotic tissue has also been proved to have antisulfonamide effects in a wound.

CHOICE OF DRUG

The choice of the sulfonamide drug to be used in the control of known infections should be based on (1) bacteriologic diagnosis; (2) experience gained by a knowledge of the experimental therapeutic background of these drugs; (3) the pharmacologic action of the drug in man; (4) the clinical efficacy of the drug, and (5) the variety, frequency and severity of the toxic reactions to its use.[8]

LOCAL APPLICATION

Crystalline sulfonamides are being used extensively in the local treatment of wounds, and the present war will give us much information as to their value when applied locally. At present, we know that crystals of sulfanilamide are highly effective in a topical dressing in open wounds infected with the hemolytic streptococcus. Sulfathiazole in crystals is the drug of choice for local application in staphylococcic infections.

Pastes and ointments with the sulfonamides incorporated have been used recently for local application. This method of application is still under investigation, however.

Sulfanilamide powder, up to the present, has been more widely used in wounds. Sulfathiazole has been used, but owing to its lower solubility, it has a tendency to cake or crust and to act as a foreign body.

SULFANILAMIDE

When taken by mouth, sulfanilamide is readily absorbed through the gastro-intestinal tract. After a single dose by mouth, absorption is virtually complete within four hours. Sulfanilamide is evenly distributed throughout the body tissues with the exception of the brain, fat and bone. Absorption is almost total and the drug is readily excreted by the normal kidneys.

SULFAPYRIDINE

Sulfapyridine is of no special interest in the treatment of dental diseases or infections so far as is known at present. Its properties are similar, so far as toxicity and dosage are concerned, to those of sulfanilamide. It is used largely in the treatment of pneumonia.

SULFADIAZINE

Pharmacologically, sulfadiazine resembles sulfapyridine. Administration of sulfadiazine has fewer toxic reactions than does administration of sulfanilamide, sulfapyridine or sulfathiazole. In patients with an idiosyncrasy to sulfanilamide or sulfathiazole, sulfadiazine is a valuable substitute.

SULFATHIAZOLE

Administered by mouth, sulfathiazole is at its maximum concentration in the blood in from three to six hours. The drug is fairly evenly distributed throughout the body tissues, although it does not pass readily into the spinal fluid. Sulfathiazole is excreted rapidly by the kidneys and, for that reason, is sometimes difficult to maintain in adequate concentration in the blood and tissues. The drug dissolves very slowly and for that reason must be administered systemically by the oral route.

SULFAGUANADINE

Sulfaguanadine is almost a specific for gastro-intestinal diseases and infections, but, so far, has no particular value in treatment of dental infections and diseases.

From a study of the above-mentioned drugs, only sulfanilamide, sulfathiazole and perhaps, in certain individuals, sulfadiazine have thus far seemed to have a definite value in the control of dental disease and infection. For a more complete description of all the sulfonamide

drugs, the reader is referred to New and Nonofficial Remedies 1942, published by the American Medical Association under the direction and supervision of the Council on Pharmacy and Chemistry.

DOSAGE

The administration of any of the sulfonamide drugs should be carefully checked and the dosage understood. The various symptoms that occur in cases of toxicity and idiosyncrasy to this group of drugs should be studied so that they will be instantly recognized.

The dosage of sulfanilamide depends on the type and severity of the infection, but, in severe infections, an initial *per os* dose of 0.1 gm. per kilogram of body weight may be administered, followed by doses of one-sixth the amount of the initial dose at four-hour intervals day and night until the temperature has been normal for seventy-two hours and the infection has localized or subsided.

In diffuse staphylococcic cellulitis, lymphangitis or acute osteomyelitis in adults, sulfathiazole may be administered as follows: an initial dose of 4 gm. (60 grains) followed by doses of 1.5 gm. (22.5 grains) every four hours day and night as long as there is evidence of a spreading infection. The dose can then be reduced to 1 gm. (15 grains) every four hours day and night and continued as indicated.

In children, the initial dose should be calculated on the basis of 0.2 gm. per kilogram of body weight, up to 20 kg. of weight. The total daily dose is calculated on the same basis and should be divided into six parts given at four-hour intervals until the temperature has been normal for forty-eight hours. The dosage can then be reduced to 0.5 gm., or 1 gm. every four hours for fourteen days.[13]

An interesting and important observation that has been made here in the tropics is that initial doses of the sulfonamides need not be so large to secure a good blood level. Our men are usually quite dehydrated from constant perspiration in this climate and smaller initial dosage has proved adequate.

DOSAGE

Pounds	Kilograms
11	5
22	10
33	15
44	20
55	25
66	30
88	40
110	50
132	60
154	70
176	80
198	90
220	100
242	110

In staphylococcic bacteremia, there is a strong possibility that a relapse will occur unless treatment with the drug is prolonged.

TOXIC MANIFESTATIONS

Patients who are receiving any one of the sulfonamide drugs should be seen daily in order that any possible toxic effects arising in the course of treatment may be noted and correct procedures be taken to eliminate the drug.

A résumé of the various toxic conditions arising from the use of these drugs follows. It is believed that experience in the administration of these drugs, after a thorough understanding of the known facts, is the only means of becoming efficient in recognizing these symptoms.

CYANOSIS[11]

A condition in which the skin has a dusky appearance is referred to as cyanosis, which is seen quite often in patients taking sulfanilamide. It is less often seen in sulfapyridine therapy and only rarely after administration of sulfathiazole and sulfadiazine. Cyanosis has been viewed with less alarm by physicians as they have gained more clinical experience in the administration of these drugs. If the drug is badly needed, cyanosis need

not indicate discontinuance, but may, on the other hand, indicate a change from sulfanilamide to sulfathiazole or sulfadiazine.

ACIDOSIS[12, 15]

An apparent reduction in the alkali reserve occurs when sulfanilamide is administered, but it does not seem to follow sulfathiazole or sulfadiazine therapy.

The administration of a one-sixth molar sodium lactate solution will accomplish the double purpose of supplying fluids and alkali to patients under sulfanilamide therapy. This procedure is advocated by most physicians in sulfathiazole therapy also, as, though there is no acidosis, it is advisable to render the urine alkaline to reduce crystalluria.

CRYSTALLURIA, HEMATURIA AND ANURIA[10]

Since the sulfonamides are chiefly excreted in the urine, high dosage or concentration of the drugs increases the possibility of crystalluria. In using large amounts of the drugs, the daily volume of urine should be observed and enough fluids forced to prevent the urinary output from falling below 1,200 cc. a day.

Sulfapyridine crystals have been described as arrow-shaped or as bundles of long pointed wedge-shaped crystals. These sharp crystals may lacerate the mucosa of the urinary tract, causing hematuria. The presence of blood in the urine is a warning of potential anuria. Large concretions may form and obstruct the ureters, and more serious troubles arise.

NAUSEA AND VOMITING[15]

When sulfapyridine is administered orally, nausea and vomiting are quite common. Sulfathiazole and sulfadiazine therapy causes much less. The use of coated tablets has been advised, to reduce these symptoms. It is obvious that if the patient vomits, the drug is lost and no appreciable amount will be absorbed into the blood or tissues of the body. A change to one of the applicable sulfonamides will in most cases control the vomiting.

NERVOUS AND MENTAL SYMPTOMS[10]

Dizziness and headache are common after the administration of sulfanilamide and sulfapyridine. With sulfathiazole and sulfadiazine, they are less common.

Mental depression and lethargy often follow the use of sulfanilamide therapeutically. The patient may become irrational and disoriented.

Experiments on dogs have shown that a concentration of sulfanilamide of 40 mg. per hundred cubic centimeters of blood will cause excitement, weakness and ataxia. Concentrations of 100 mg. per hundred cubic centimeters will cause prolonged coma and later paralysis.[10]

HEMOLYTIC ANEMIA AND HEPATITIS[17]

Hemolytic anemia has been found by Wood[17] to have an incidence of 2.4 per cent in adults and 8.4 per cent in children after sulfanilamide therapy. It occurs less frequently after administration of sulfapyridine, rarely after sulfathiazole and has been unreported thus far after sulfadiazine. Symptoms may be noted on the second day of administration in a mild form and, if treatment is continued, a rise in the reticulocyte count and icteric bilirubenemia will result.

It is advisable to change to sulfadiazine or sulfathiazole under such circumstances.

Sulfanilamide is apparently the drug causing most severe hepatitis. When jaundice occurs, both hemolytic anemia and hepatitis should be suspected.

GRANULOCYTOPENIA; AGRANULOCYTOSIS[9, 10]

According to Long,[9] leukopenia follows sulfanilamide therapy in 0.3 per cent of cases and agranulocytosis in 0.1 per cent. This response is probably the result of an idiosyncrasy on the part of the patient. A rapid fall in the white blood count to

normal after administration of the drug is no cause for alarm. However, if the leukocyte count continues to fall, to below normal, the drug should be discontinued. Leukocyte counts become increasingly important the longer the administration of sulfanilamide is continued. Forcing fluids, rest and a discontinuance of the drug are indicated.

DRUG FEVER AND RASH[2]

A fever may develop from five to ten days after the initiation of sulfonamide therapy. This may be accompanied by a dermatitis. On discontinuance of the drug, the dermatitis and fever usually disappear. A continuance of the fever would indicate that it was due to infection. The dermatitis may be due to toxicity from overdosage, purely allergic reactions or allergotoxicity.

We cannot assume that anything and everything that goes wrong under sulfonamide therapy is of necessity an effect of the drug. Other conditions that have been described after the use of these drugs are hyperleukocytosis with acute hemolytic anemia, purpura hemorrhagica, pain in the joints, stomatitis, bleeding from the gastro-intestinal tract and diarrhea. A disturbance in vision may also develop, probably being due to toxic optic neuritis or edema of the lens.[10]

The dentist of course cannot be expected to take care of all of these toxic manifestations, but if we use these drugs, we must be able to recognize these adverse symptoms and, with the help of competent physicians, eliminate them.

MORE SPECIFIC USES IN DENTISTRY

Now that we have a knowledge of the fundamentals in sulfonamide therapy, we can narrow their application and administration to our problems in dentistry.

BACTERIOLOGY

Let us review briefly a few facts from the bacteriology of the oral cavity. Normally, the bacterial flora of the oral cavity is composed of enormous numbers of many kinds of bacteria and quite often various protozoa and fungi. Of these organisms, many are harmless saprophytes and some are potential pathogens. Virulent bacteria are at times harbored by the individual with sufficient resistance to prevent the development of clinical infection, while in others disease will develop. Bacteriologic studies of the oral cavity are, therefore, difficult, their interpretation requiring experience and understanding.

Dental infection is responsible for a number of systemic conditions, and early recognition and eradication of the focus are important. A study and cultures from typical chronic periapical abscesses in a great majority of cases show the alpha (viridans) streptococcus. Infections of this type are responsible for a great number of the focal infections. Infection often remains after extraction, for months and even years, deep in the tissues and bone.

For this reason, routine use of one of the sulfonamides is advocated preoperatively, postoperatively, locally and systemically when such infections are encountered.

Infections of the maxillary sinus, while not directly concerning the dentist, often are the result of extension of a tooth root infection through the sinus floor. Sulfonamide therapy will help to prevent and control these infections.

When we are confronted with an acute periapical abscess accompanied by pain, swelling and the common symptoms of this condition, the application of hot magnesium sulfate packs should still be used, along with sulfonamide therapy. The localization of the infection is of prime importance and the administration of the sulfonamides is an aid in the control of the infection. We cannot sacrifice all our "tried and true" procedures just because we are administering one of these drugs. Such infections are more easily controlled, and surgical interven-

tion to evacuate pus has to be resorted to less often before extraction.

LOCAL APPLICATION

As we have noted, sulfanilamide and sulfathiazole have thus far been the drugs of choice for local application. I prefer the use of sulfathiazole for its wider bacteriostatic effect on organisms encountered, its prolonged effect and the phagocytic response to it. Sulfathiazole is less soluble than sulfanilamide and, for this reason, I believe more applicable in tooth sockets when we remember that the local anesthetic (procaine) breaks down in part into para-aminobenzoic acid, which is an antisulfonamide. The sulfathiazole, by being less soluble, is present in the wound and tissues long after the elimination of the anesthetic. Sulfathiazole is more efficacious in the treatment of wounds involving bone.[18]

No detail of oral surgery should be neglected because sulfonamides are being used. Evacuation of pus when localized, irrigation of the wound and the removal of all necrotic material are important, since these products of infection inhibit the drug action locally.

The wound should be gently irrigated with an isotonic solution of sodium chloride at each dressing. Recently, I have begun to use a solution of azochloramide for irrigation, as it is a mild oxidizing agent and it has been shown that this solution helps to neutralize the effects of sulfonamide inhibitors. There is some evidence that azochloramide acts synergistically with the sulfonamides.[9] A mild solution of this agent may be prepared according to the instructions received with the tablets or powder, which gives a solution containing azochloramide 1 : 3,300. This solution is diluted with three volumes of water and stored in a dark brown bottle, as it is sensitive to light.

Sulfonamides do not sterilize themselves and spores have been grown from drugs not properly sterilized.[5] Only sterile powders should be used in open wounds. If not received in a sterile condition, the drug can be sterilized by dry heat at 120° C. for twenty minutes or by autoclaving at 15 pounds pressure for twenty minutes.[8]

Various methods have been advocated for the local application of the drugs to sockets after extraction. The use of the conical tablets manufactured to supposedly fit the alveolus has proved to be unsatisfactory in my hands. These tablets are slow to dissolve and act as a foreign body. If powder is not available, the tablets should be triturated before use.

My method of application of sulfathiazole has proved very effective thus far. I use a paste of sulfathiazole powder in pure glycerin for application to the socket, over which an exodontia sponge is placed for the patient to bite upon and to hold in place. The patient is instructed to allow the sponge to remain in place for from twenty to thirty minutes to insure retention of the drug and allow it to take effect. This paste can be prepared by adding to one-quarter pound of the powdered drug sufficient pure glycerin to make the paste as thick as desired. The paste is stored in a jar with tightly fitted cover as it tends to dry out if exposed to the air. This paste will not crust or form a hard cake in the wound as the glycerin will mix freely with the blood and serum.

It is impossible to prevent saliva from entering the wound for any length of time and, for this reason, a glycerin paste seems to be more applicable than one which will not mix with the body fluids or the saliva.[4]

Excessive exudate, which somewhat retards healing,[6] has been reported after local application of the sulfonamides. The use of sterile powder and care not to apply too much to a wound will help prevent this.

SUMMARY

The use of sulfonamides cannot re-

place satisfactory surgical procedures and should not be relied upon to do so.

For systemic administration, a thorough knowledge of both the required dosage and the toxic manifestations should be had by the dentist. The drugs are absorbed more readily if given before meals.

Routine use of either sulfanilamide or sulfathiazole has been proved of value in controlling and preventing infection after extraction.

Sulfanilamide and sulfathiazole locally applied are well tolerated by the various tissues of the body. Sterile powders should be used for local application.

In already infected wounds, various products of the infection are present which inhibit the action of the sulfonamides. A poorly debrided or carelessly drained wound is a poor site for application of any of the drugs, as the drugs fail to exert a prophylactic effect on clean wounds and have little, if any, effect on already infected tissue. Good drainage, irrigation with a mild agent and the removal of all necrotic tissue are important.

In dentistry, we rarely, if ever, suture a wound without allowing for adequate drainage. For this reason, the dentist is not concerned, as is the physician, to a great extent with the problem of sulfathiazole or sulfanilamide forming a crust or cake and thus presenting a foreign body.

BIBLIOGRAPHY

1. LEDERER, F. L.: Diseases of the Ear, Nose and Throat. Philadelphia: F. A. Davis Co., 1942, pp. 423-432.

2. GREENWOOD, A. M.: Skin Manifestations Due to Sulfanilamide and Its Derivatives. *New England J. Med.*, 224:237, February 6, 1941.

3. HEGGIE, J. F.; KENDALL, A. W., and HEGGIE, R. M.: *Brit. M. J.*, 2:658, December 1942.

4. HELBRAUN, H. W.: Prophylactic Use of Sulfathiazole in Oral Surgery: Clinical Study. J.A.D.A., 30:1197, August 1943.

5. KEY, J. A., and FRANKEL, C. J.: *Ann. Surg.*, 113:284, February 1941.

6. KEY, J. A.: *J.A.M.A.*, 117:409, August 9, 1941.

7. LEVY, A. T.: Improvement on Procedure of Topical Application of Sulfa Drugs. J.A.D.A., 30:1045, July 1, 1943.

8. LONG, P. H.: Clinical Use of Sulfanilamide Compounds in Prophylaxis and Treatment of Infections. *Northwest Med.*, 40:311, September 1941.

9. *Idem:* Sulfonamide Compounds in Prevention and Treatment of Wound Infections. *J.A.M.A.*, 121:303, January 30, 1943.

10. MARSHALL, E. K.; CUTTING, W. C., and EMERSON, KENDALL: Toxicity of Sulfanilamide. *J.A.M.A.*, 110:252, January 22, 1938.

11. MARSHALL, E. K., JR., and WALZL, E. M.: Cyanosis from Sulfanilamide. *John Hopkins Hosp. Bull.*, 61:140, August 1937.

12. MCCHESNEY, E. W.; SPRAGUE, K. D., and MARSHALL, I. H.: Effect of Sulfanilamide on Acid-Base Balance. *J. Lab. & Clin. Med.*, 26:1154, April 1941; correction, 26:1394, May 1941.

13. New and Nonofficial Remedies. Chicago: American Medical Association, 1942, p. 139-166.

14. STITT, E. R.; CLOUGH, P. W., and CLOUGH, MILDRED C.: Practical Bacteriology, Haematology and Parasitology. Ed. 9. Philadelphia: Blakiston Co., 1938, pp. 606-615, 707-774.

15. SOUTHWORTH, HAMILTON: Acidosis Associated with the Administration of Para-Amino-Benzene-Sulfonamide (Prontylin). *Proc. Soc. Exper. Biol. & Med.*, 36:58, February 1937.

16. SPINK, W. W.: Sulfanilamide and Related Compounds in General Practice. Chicago: Year Book Publishers, Inc., 1941.

17. WOOD, W. B., JR.: Anemia During Sulfanilamide Therapy. *J.A.M.A.*, 111:1916, November 19, 1938.

18. Infected Wounds Involving Bone. *Brit. M. J.*, 2:658, December 5, 1942.

ADVANCED THOUGHT IN INDIRECT INLAY AND FIXED BRIDGE FABRICATION

PART I

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IN the fabrication of gold inlays, whether it is argued that the individual restoration should be made by the direct or whether by the indirect process, the fact remains that it is at least a convenience to have a die of metallic permanence against which the casting can be worked and polished. No quarrel need be raised with either school of thought. Both methods have their place. We are interested here in considerations affecting the successful fabrication of large restorations, both as they affect large individual inlays and as they affect inlays which act as supports for bridges and partial dentures.

The current of events in dentistry is placing new and added significance in the use of dies in dental restorations. The advantage in using dies for restoring teeth in remote parts of the mouth, for rehabilitating teeth greatly damaged by caries, for lengthening the crown height of tipped teeth and for restoring teeth adjacent to an edentulous area, as in the construction of inlays for bridge and partial denture work, has been discussed in a previous article. Today, technologic refinements have reached the point where dies are employed to restore the teeth of whole dental arches, both upper and lower together, at a single undertaking. The scope of this article, however, will be the presentation of such matter as will embrace the development and use of dies in the average practice.

From the Charles Godwin Jennings Hospital, Dental Department.

Despite the refinements alluded to above which call for the use of colloidal impressions and stonelike dies obtained therefrom, it seems undeniable that a technic which will produce a metal die would be the one of choice. Until we can electroform dies, or obtain metal dies of accuracy in some other manner, from the colloidal impression materials, we cannot take advantage of the ease of manipulation and elastic qualities which that material affords.

In lieu of the more nearly ideal impression material, dental compound is still the indirect inlay impression material of choice. Distortion of the impression must be obviated by mechanical devices. Most of the material presented in my article of August 1941 still holds true. Emphasis may, however, be placed on certain procedures involved in the technic; certain pertinent facts might be reviewed for critical circumspection, and improved methods of accomplishing ends might advantageously be presented at this time.

This article will be divided into three parts. The first and second parts will deal with an analysis of the problem. The third part presents a technic calculated to capitalize on the deductions or conclusions derived from a consideration of the first and second parts.

Of all the services embraced by the term dentistry, perhaps none offers more incentive to the creative mind than the surgical treatment, preparation and filling of teeth with gold inlays. Inlays are undoubtedly the most substantial replace-

ments that we of the dental profession construct. They are indestructible in the oral environment. They provide hygienic restorations. They permit great facility in restoring contact, occlusion and function. They are effective in the control of caries. They support and strengthen the remaining, weakened tooth structure, and they possess long serviceability. In addition to the preceding, qualities approaching very closely the properties of an ideal filling material, inlays form the very basis of the rather complex and ambitious undertakings known as dental prostheses. With so much at stake, one would assume that mastery of inlay fabrication would be reduced to a cut-and-dried procedure. This is true to a degree, but the preparation of teeth for prosthetic foundations is often a haphazard procedure with little intelligent direction. Many operators prepare inlays for bridge abutments with little if any variation from the usual mesioclusal or distoclusal individual inlay. Yet the function of castings bearing bridges or other prostheses is greatly altered. What are the principles which should guide one in the preparation of abutment teeth?

In studying this problem, perhaps it would be well to substitute the more general term "casting" for "inlay" when the term refers to a prosthetic anchorage, for the inlay becomes an onlay when the axial walls are disked buccolingually, the onlay becomes a three-quarter crown when the lingal surface is disked as well and the three-quarter crown becomes a jacket if all four axial walls are disked. Likewise, the term "abutment," which refers to the support at each end of the entire bridge, as defined by Webster, may by extension refer to the anchorage of the bridge as well. The ambiguity may at times be confusing, especially if the foundation as well as the anchorage is being treated simultaneously. At the risk of redundancy, the anchorage may be differentiated from the foundation by the hyphenated term "abutment-casting," since the simple application of the term "casting" may even refer to the pontic.

Obviously, a rationale of cavity preparation for castings should be evolved on the basis of physical properties, structural demands and economy. In addition, there are certain elements which have a more subtle influence. Thus, somewhat more specifically, the following facts should be taken into cognizance, and according to their relative importance, a rationale of cavity preparation should be devised that will satisfy all or the greatest number of the conditions.

1. The cavity preparation must be such as to permit the placing of an accurately fitting casting. An inaccurately fitting casting is not only unpredictable from the standpoint of serviceability, but also violates all of the other following specifications.

2. It should be conservative of tooth structure and all related dental tissues. Conservation of tooth structures must not compromise condition 9, but it is vitally important in consideration of condition 6. This rule is particularly important in emphasizing the need of a relatively shallow preparation. Frequently, we are called upon to prepare abutment teeth for castings when these teeth possess no cavities or fillings. Such teeth often exhibit very large pulps even though the patient is elderly.

3. The preparation should incorporate surgical principles to protect the teeth against recurrence of caries.

4. It should permit restoring the remaining portion of the tooth to the original or functional form, and the preparation should be such as to give the remaining portion of the tooth strength and serviceability.

5. The preparation should not violate prophylaxis when the casting is cemented to place. The placing of castings on prepared teeth should in no way ac-

celerate deteriorative processes present.

6. The preparation should be such as to make the casting esthetically acceptable.

7. The cavity preparation and subsequent procedure should be accomplished expeditiously. These steps in dental reconstruction should not entail such intricate chair or laboratory procedures as to make fabrication impractical or unreliable for the average operator. This consideration leads directly to paragraph 8.

8. The cavity preparation and subsequent procedures should be accomplished simply enough to make this kind of dental service economically accessible to the bulk of humanity.

9. Certainly the most obvious considerations for establishing a rationale of cavity preparation are the engineering principles and physical conditions that operate for success or failure when teeth and castings are used for a given job.

While it is not the intention to prejudice opinion for one school of thought as opposed to another, it has been my experience that in view of the conditions enumerated here, and in consideration of certain facts which will unfold subsequently, the indirect technic fits into the scheme of things somewhat more satisfactorily than the direct.

To the prosthetist of precise workmanship, dies of the abutment castings in the construction of appliances are indispensable. It is unfortunate that, in fixed bridgework, the surfaces most in need of a high polish for prophylactic purposes, to wit the mesial and distal surfaces of the abutment castings which approximate the pontic, are most inaccessible to polishing if the supporting castings have been made by the direct method. They may, of course, be polished before the making and soldering of the pontic, but such polishing is completely vitiated by the succeeding operation. Polishing of the surfaces approximating the pontic may be attempted before cementation of the bridge by rotating sandpaper, cuttlefish and crocus disks successively, across these surfaces "free style," at the risk of polishing off or turning over the vital cervical margins of the abutments. This difficult phase of bridge construction presents no problem when the abutment castings are of the indirect type.

The handling of inlays during bridge or partial denture construction is greatly facilitated by the use of dies. Recesses for lugs or dowels may be cut in the castings where needed at a greatly reduced risk of injury to the operator or to the margins of the fillings themselves. Almost invariably when working without dies, one deforms the margins of the castings to a greater or less degree. Especially is this true if the castings have been previously polished. The indirect worker becomes quickly apprised of the inaccuracy of castings which receive much manipulation without the support of dies. Such inadvertent inaccuracies can be quickly corrected, however, by the mere expedient of washing the casting and die free of débris and swaging the filling to the die in a semihydraulic swaging press.

It is noteworthy that the very act of grinding a casting into occlusion is attended by a certain degree of disturbance to the accuracy of its fit. This must hold true for direct as well as indirect castings; for if an accurately cast inlay is spot ground to occlusion, the fully adjusted inlay will not, in most cases, return to the die to its full depth. Even if the carbon markings are obtained in the usual manner, and occlusal and marginal adjusting is done on the die, the fully adjusted and polished inlay is usually raised from its seat. This may be verified by washing the die and the inlay, and then swaging the two together. Presumably, one or both of two things happen: 1: The inlay is raised from its seat by the slight jarring incident to the grinding operation and, when the grind-

ing approaches the margins of the filling, these are bent or spun downward to maintain the inlay in its elevated position. Undoubtedly, this also takes place if a direct casting undergoes much grinding before cementation. 2. Adjusting the inlay to occlusion and contouring the casting to the tooth form thin down the margins of the casting so that subsequent swaging permits the margins to be deflected enough to allow the casting to be seated more nearly completely. This statement may seem odd and may seem to contain a naïve indictment of indirect methods. Actually, it is only a reminder that we are still not casting to dimension.

Accurate dies can be made only from accurate impressions. The latter require freedom from undercuts, anatomic as well as those occasioned by cavity preparation itself in that part of the tooth which is being included in the impression. It is mandatory that anatomic undercuts be reduced or sliced in order that the retraction of the impression tube shall not impart excessive strain with permanent deformation of the impression material. This rule should not be accepted as a blanket excuse for the indiscriminate sacrifice of sound tooth structure. There is a nice balance which experience and good judgment will establish as to the amount of slicing necessary. A typical mesioclusodistal preparation requires somewhat more reduction of the mesial and distal convexities and a greater occlusal convergence of the cavity walls than two inlays, a mesioclusal and a distoclusal, in the same tooth would require. Likewise, when caries occurs near the cervix of the tooth, more reduction of the mesial or distal convexity will be required than would be necessary were the carious lesion just beneath the contact point. It should always be borne in mind that the reduction of the anatomic bulge is accomplished at the expense of retention form.

Inlays are subjected to a variety of forces tending to displace them. One is a rotational displacement tending to roll or rock the inlay buccolingually in its seat in the cavity. Riding of cusps of the opposing teeth on the inclined planes of the inlay in the lateral excursion of the mandible during the act of mastication has this effect. Compression, tension and exaggeration of these forces when impact occurs, as in clicking the teeth voluntarily or by accident, are other displacing forces. Rotational displacement mesiodistally, while not so annoying a factor in individual replacements, must be reckoned with in bridgework, particularly when the loose joint fabrication is employed, and is a frequent cause of failure in this type of restoration. Consequently, we must provide against displacement of castings in all three dimensions, and this consideration profoundly affects cavity design.

It would perhaps be well to expand dental nomenclature to denote these displacing forces by name. They will generally be identified with problems arising in bridgework or prosthetic dentistry, but they are none the less important here because their consideration modifies the rationale of cavity preparation. Those forces acting through a moment arm and which bear against the inclined planes of the cusps of the castings or the pontic, as well as all forces which bear buccally or lingually from the axis of suspension of the bridge and consequently tend to produce rotation, shall be referred to as "occlusal torque." (Fig. 1.) Forces operating in the long axis of the tooth which place the abutment castings in direct compression or tension shall be termed "axial forces." Forces tending to displace castings mesiodistally usually take the form of rotation wherein one surface of the casting acts against the tooth as a fulcrum, and an arc of curvature is set up between the jaws which acts in a plane separated by 90 degrees from that occurring in occlusal torque. We can designate such

forces as those producing "mesiodistal" or "intermaxillary" torque. The latter may be considered "negative" or "positive" depending upon whether it is directed away from or toward the apex of the tooth involved. Its consideration is important in bridgework because it gives rise to significant stresses in the abutment castings of the bridge. In semifixed bridgework, that is bridgework supported by a recess and dowel in one abutment, mesiodistal torque occurs in a negative direction whenever food is being masticated, but is greatest during the mastication of sticky foods, certain dried and candied fruits, caramel, etc. (Fig. 2.) Likewise, stress brought to bear upon the

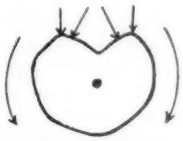

Fig. 1.—Occlusal torque.

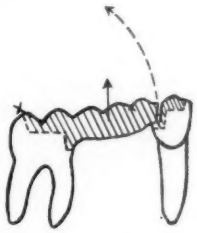

Fig. 2.—Intermaxillary torque.

prominences of the unground cusps of abutment teeth, as when hard food engages these surfaces before the equalization due to saliva and comminution of the bolus asserts itself, has a tendency to depress these teeth, especially if they are tipped and, in effect, to pry the tooth away from the bridge. The bridge span acts as a lever, and the fulcrum is established at the most distant point where the structure bears upon the depressed tooth. (x, Fig. 3.) Intermaxillary torque of a positive character is set up during the deflections of the bridge while in function.

Since inlays are retained in their cavities by a cement bond, the security with which they are retained is a function, among other things, of the cohesion and adhesion of this bond. Study of the physical properties of cements under compression, tension and shearing stress should prove very valuable for our purpose here, but, except for the fine work done on crushing strength and adhesion of dental cements by the U. S. Bureau of Dental Standards, such investigation has not been made by any authority known to me. It seems that the property of

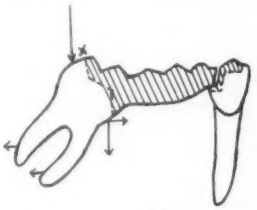

Fig. 3.—Intermaxillary torque.

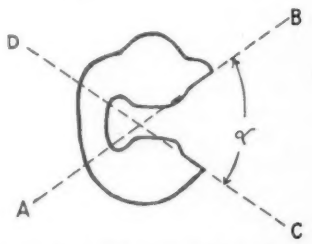

Fig. 4.—Occlusal view of Black's type of box preparation with divergent opposing axial walls.

dental cement under shearing stress is quite as significant as that under compression.

As a result of its experiments, the U. S. Bureau of Dental Standards reports that dental cements have practically no adhesion. Let us dismiss adhesion as a constituent, then, from further consideration.

While the problem resolves itself into a study of the physical properties of ce-

ments after the manner in which engineers treat the subject, actually the problem is infinitely more complex. What we wish to consider are not these qualities in bulk, but rather their significance as they are manifested in the countless little prolongations which engage the dentinal tubules and irregularities of the tooth on one side with the irregularities or roughness of the casting on the other side. It is the rupture of these prolongations that causes failure of the dental bond.

The security or integrity of the bond will be determined by the physical properties of the cement in compression, tension and shear; the nature of the bonded surfaces, that is their relative irregularity or roughness; the areas involved in the bond, and the degree of parallelism or pitch between opposing walls of the cavity. Strangely enough, theoretically, the intimacy of contact between the casting and the tooth is not a factor when the mutual tolerance of the two is not grossly disparate.

A high resistance to shearing stress should be a valuable quality in dental cements. Certain dental restorations undoubtedly subject the cement bond to extreme tests of its physical properties. Thus, while individual inlays generally present no problem with respect to preserving the integrity of the cement bond because practically all stress brought to bear on them, regardless of the kind of cavity preparation, is resisted by the cement over relatively large areas under compression, bridge inlays do present a problem because they are in effect cantilever bridges themselves, and the cement cradling these fillings is not subjected entirely or, in most cases, even largely to compression. That restorations of the latter category have not failed may be a testimonial rather to the adaptation of the patient than to the adequacy of the service. Other factors also play a part. Paradoxical though it may seem, if the teeth supporting the bridge have mobility, the strength of the cement, particularly under shearing stress, is less liable to be violated than if they are firm. This will be discussed at greater length later. It is mentioned here to emphasize that shearing stress as it affects dental cement is a quality and quantity which should be studied closely. Its value, as denoted by the number of pounds per square inch, may not be large, but since it bears a relationship to surface phenomena, it may well be a governing factor in cavity design.

Comparing the shearing stress component of dental cement with that of concrete, we note that the allowable stress in direct compression on concrete is about 600 pounds per square inch. The allowable shearing stress is about 125 pounds per square inch. While figures pertaining to stress in tension on concrete are seldom used, the figure 20 pounds per square inch is sometimes applied. One can see here that the safe value for the shearing stress approximates that for tension more closely than it does that for compression. There is no doubt a close analogy between the order of the values assigned to concrete and those applying to dental cements and, unquestionably, tension and shearing stress in such substances as dental cement are frail qualities when compared with strength in compression. While tension on the cement bond occurs, we know that it is not significant in maintaining retention. Its deficiency is made up by shearing stress. When an inlay or a bridge retainer is placed in direct axial tension, as might occur in the mastication of sticky foods, the strength of the cement in shearing stress is the only property of the bond that operates to preserve its integrity. Usually, however, mastication of sticky foods with a semifixed type of bridge construction does not impart direct axial tension to the primary abutment casting. Instead, since the cement under the primary retainer tends to restrain the movement of the

pontic as well as the primary retainer, the resultant force operating against the bond is that of torque. The negative force exerted through the moment arm of the span of the bridge places the cement of the primary abutment at a greatly magnified disadvantage. To counterbalance this disadvantage, the torque invokes a certain amount of mechanical interlocking between the metal of the abutment casting and the cavity walls of the prepared tooth, provided the orientation of the metal in the abutment casting is correct. There is also some compression of the cement when torque occurs, but the rest of the burden is borne by the cement under shearing stress.

Since improvements in dental casting technic yield castings with a progressively smoother surface texture, retention for

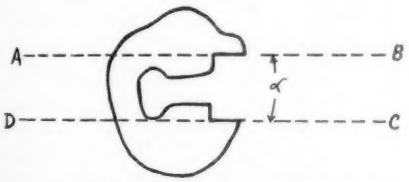

Fig. 5.—Box preparation with parallel axial walls affording maximum retention against mesiodistal displacement through locking by the cement.

cemented prostheses must be secured either through providing an adequate metallic locking between the casting and the tooth to resist torque (known as providing resistance form) or extending the area of the cement bond in those regions subjected to shearing stress to such an extent that the value for shearing stress shall not be violated. One other device presents itself, that of roughening the attachment prior to cementation. Undoubtedly, this recourse has value, but it is secondary to the alternatives suggested.

Let us see how some considerations of cement bond affect cavity design. If we assume that the effect of the dovetail will be uniform for each of our illustrations, we may disregard its influence in the present study.

When lines AB and CD, denoting the planes of the buccal and lingual axial surfaces of a box preparation, are extended, as can be seen from Figure 4 they intersect and thus form an angle α, of varying degree, depending on the divergence of the walls of the "box" portion of the cavity. In the extreme case, these walls are parallel and α is zero. (Fig. 5.)

On the other hand, the axial walls of a slice preparation approach an angle α of 180 degrees. (Fig. 6.)

In box-type cavities, opposing cavity walls are more nearly parallel than in

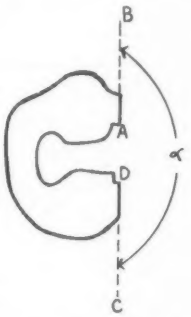

Fig. 6.—Slice type preparation affording the least security by cement locking against mesiodistal torque.

slice-type preparations; consequently, inlays in box preparations are better retained by the cement bond. Theoretically as α of Figure 5 approaches zero, the value of the locking provided by the cement bond against intermaxillary torque should be the maximum, and as α approaches 180°, the cement locking approaches zero. For cemented inlays, then, it can be stated that the retention inherent in the axial portion of the preparation varies inversely as α. If we assume that the pitch of the axial walls, occlusocervically, remains constant, the box-type mesioclusal or distoclusal in-

lays have a distinct advantage over the slice-type castings in resisting intermaxillary torque. In this analysis, the resistance to displacement conferred by the dovetail has been disregarded, although it exists, and may or may not be quite significant, depending on whether the pitch of the dovetail walls is of such an order as to be effectual in resisting torque.

Box-type inlays also have an advantage when fabricated for mesioclusodistal inlays, although the margin of advantage here is considerably lessened because of the greater opportunity to employ mechanical resistance to displacement by mesiodistal torque. The resistance form of a mesioclusodistal casting can be very effective in resisting displacement of the casting by the negative forces of mastication although its value in withstanding the stress set up by the positive forces of mastication is inferior to certain other types of anchorage. Let us regard Figure 7 as showing a mesioclusodistal casting on a tooth with its axial wall CD perpendicular to the occlusal plane of the tooth and the base line AB. If we consider any terminal margin such as x, x1, x2, etc., at which fulcrumage occurs when intermaxillary torque occurs at Z, we may use the shortest distance from a point on that margin to the plane of the opposite axial wall as a radius, and strike the arc x. Since the arc falls within the body of the tooth, and since xF is the hypothenuse of the right angle triangle FxE, and consequently must be longer than xE, we must conclude that the tooth would resist the intermaxillary torque exerted at Z, even if there were no cement bond between the casting and the tooth. Good surgical technic would never countenance terminating a mesioclusodistal inlay with as relatively short a flange as that denoted by x in Figure 7. As the terminal margin is moved progressively farther and farther apically, the mechanical engagement along CD becomes a progressively greater quantity, as shown by arcs x1, x2, x3, etc. Since the importance of

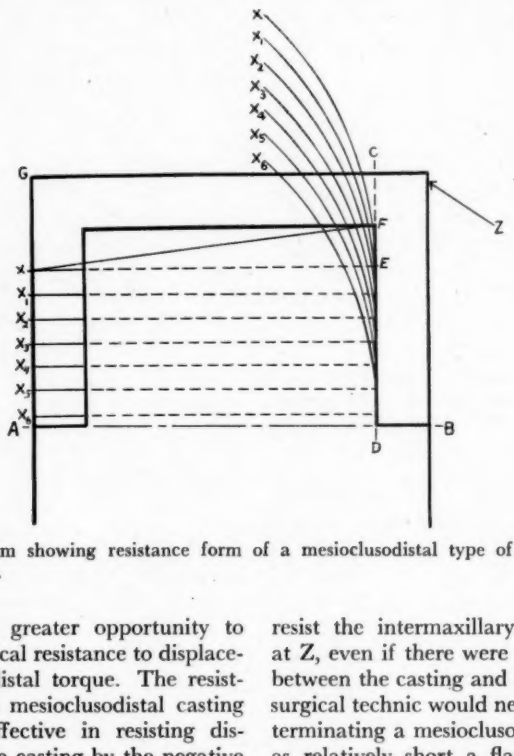

Fig. 7.—Diagram showing resistance form of a mesioclusodistal type of abutment against mesiodistal torque.

mechanical engagement or locking is a much more significant consideration when weighed against the advantage of cement locking, and since the opportunity for utilizing mechanical resistance is a quality common to the box-type as well as the slice-type inlay, any advantage which the box-type inlay might exhibit through greater cement locking becomes a greatly diminished value provided, of course, all other factors remain equal.

Before we leave Figure 7, we might examine very profitably certain characteristics inherent in the resistance form of a mesioclusodistal inlay or a modified form of it, the three-quarter casting. It is obvious in referring to Figure 7 that, as convergence of the axial walls of the cavity increases, the resistance form is greatly jeopardized. When the abutment preparation is short occlusogingivally, the axial wall CD, proximally from the pontic, must be almost perpendicular to the occlusal plane in order to resist intermaxillary torque. As the abutment preparation becomes longer occlusogingivally, a greater degree of pitch can be employed in the axial walls without violating resistance form. A casting fitted over a prepared cavity with a terminus at x3 and having a pitch equal to that of the chord subtending arc x4 would, for example, have no support from the tooth if subjected to torque at Z. The chord subtending arc x3 would be the critical pitch or taper for that casting, and it would be well to have much less taper than that or else the preparation should be extended farther apically along the flange AG. Any terminus apically from x3 is an advantage and, as it is moved apically, more and more of the tooth and cement under the opposite flange, CD, are brought into compression during negative intermaxillary torque, provided the inclination of the latter axial wall remains unchanged. As the angle formed by the axial wall CD of the casting becomes more acute with respect to the base line, AB, the critical point of fulcrumage, recedes farther and farther apically. These theoretical conclusions can be verified experimentally by cutting cardboard models of such a figure as that depicted by the diagram of Figure 7. As a general rule, then, for maximum resistance to displacement by mesiodistal torque, the axial wall that lies proximally from the pontic of a semifixed type of bridge construction should be as nearly perpendicular to the occlusal plane as possible, and the opposite axial flange of the abutment casting should be as long as possible.

The retention of a slice preparation against direct axial displacement is probably directly proportional to the retention exhibited by a box-type preparation.

Occlusal torque and intermaxillary torque together affect profoundly cavity preparation as it applies to bridge abutments. Stability against displacement of the casting by occlusal torque may be gained by extending certain features in the retention and resistance forms of a typical individual inlay. The pulpal and cervical floors should be flat. There should be a critical appraisal of the parallelism between the axial and dovetail walls. The dovetail should be square-cut, and should be extended buccally and lingually to the greatest buccolingual width of the tooth. To some extent, the conditions that stabilize an abutment against occlusal torque also serve to stabilize it against displacement by intermaxillary torque. However, the simplicity of incorporating axial dowel grooves in indirect inlay cavity preparations is attended by such tremendously increased resistance and retention that failure to utilize this principle is inexcusable. The grooves should be placed in dentin, be as long as possible, be as widely separated as appearance and other considerations permit and be as far away from the pulp of the tooth as the circumstances will permit. This type of abutment affords resistance against dis-

placement by intermaxillary torque far more effectively than the box type inlay, for it is mechanically retained by the dowels, and the weakness of the cement bond in shearing stress is utilized only to prevent direct axial displacement.

Any one who has tried to remove such fillings recalls that they cannot be pried out of the cavity without fracture of the tooth. They must be cut out or displaced by axial retraction or impact. Generally stated, resistance form against occlusal torque may be secured by square-cutting buccolingually in the occlusal portion of the tooth. Resistance form against mesiodistal torque, both negative and positive, may be gained by occlusogingival cutting or doweling in the proximal and lingual or buccal aspects of the tooth. The latter is not feasible in bicuspid teeth. To place the dowel on the buccal aspect is esthetically untenable. To place it on the lingual requires rather deep cutting across the pulpal horn. The problem of converting a bicuspid tooth into an abutment may be rather easily solved if the bridge span is short, by eliminating torque on the bicuspid through using the semifixed type of bridge construction. If the bridge span is long, that is greater than the span of one pontic, fixation of the bridge is indicated, and it would probably be best to use a three-quarter crown on the bicuspid tooth.

To be continued.

THE DENTAL OFFICER IN BATTLE

Cmdr. WALTER W. CROWE, (D.C.), U.S.N.

AT the present time, dental officers of the United States Navy are serving in all parts of the world under many and varied conditions. Not only are they rendering first aid aboardship in sea and air battles which are being fought both night and day, but they are also following the footsteps of the United States Marines wherever and whenever operations call for their landing.

In order to outline the duties of a dental officer in battle more thoroughly, it would possibly be best to explain the "plan of the day" aboard a man-of-war operating under wartime conditions.

In operating under these conditions, all possible precautions are taken with regard to the restriction of light, sound and maintenance of silence of the radio. Approximately one-half hour before sunset, the officer of the deck passes the word "Prepare to darken ship." At the exact time that the word is passed to darken ship, all lighting circuits on the weather decks are opened, except the battle circuits.

Smoking is not permitted on the weather decks when the ship is darkened, and all ship's bells, bugles and the general announcing system are "secured." Battle ports are closed and "dogged down," to insure that absolutely no light shall reach the enemy. Failure to comply with these orders could very easily be responsible for loss of the ship, with subsequent loss of many lives.

Approximately one hour before sunrise, the call for general quarters is made over the general announcing system:

All opinions or statements contained herein are those of the writer and are not to be construed as official or the views of the Navy Department or the Naval service at large.

"Man your battle stations." This call is repeated several times, to insure that all officers and men have heard and will follow out the instructions immediately.

The life of the ship and all aboard may depend on the prompt action with which this order is carried out. An enemy ship whose crew might reach their battle stations only a few seconds more quickly could, in this short time, decide the battle permanently and forever. Since all officers and men understand this only too well, little time is lost.

Officers and men remain at their respective battle stations until after sunrise, at which time the word is passed over the general announcing system, "Secure from general quarters."

If operating with an airplane carrier, the planes are launched from the carrier with the first gray streaks of dawn. These are the eyes of the surface ships. They are scouting and watching for any possible enemy, be he in the air, on the sea, under the sea or over the horizon.

Breakfast, served in the officer's wardroom, follows "general quarters," after which the dental officer goes below to his office. This is usually located in the sick bay, behind the armor belt of the ship. Here, he renders professional service.

Sick call is held each morning, all operative, postoperative, emergencies and treatment cases being taken care of. The remainder of the day is given by appointment. This concludes the average day other than various ship's drills, inspections, which may come up from time to time, tactical school lectures and collateral duties. Contact with an enemy submarine, surface ship or plane during the day creates an emergency and everyone goes immediately again to general quarters.

After a ship has been put into commission and has had her "shake down" cruise, the next largest problem is to train all personnel so that each and every man knows his job perfectly, and can do it under any conditions, whatever they may be. If the job is not understood before battle, it certainly will not become any clearer while the battle is going on.

To insure efficiency, first aid lectures are given, with first aid pictures, which are shown on the movie screen in order to indoctrinate and instruct the young pharmacist mate as well as the seaman, who may be called upon to save the life of a shipmate because of knowing where and how to apply pressure to arrest severe hemorrhage. He is also taught how to treat shock and burns, alleviate pain, apply battle dressings, use the tourniquet and give artificial respiration.

To alleviate pain, all officers and chief petty officers are issued a box of five morphine syrettes, each containing one-half grain of morphine tartrate in a 1.5 cc. solution. In order to insure that the dose is not repeated, patients who have been given morphine are marked with a large M, usually across the forehead. Another method is to place a piece of adhesive plaster around the patient's wrist upon which has been previously typed "Morphine, grains one-half." This adhesive plaster is placed in strips around the box containing the morphine.

The directions for use of the syrettes are as follows: Remove transparent hood, grasp wire loop and push wire in to pierce inner seal, turning if necesssary. Pull out and discard wire, thrust needle through the skin at least half its length and inject solution slowly, squeezing syrette from the sealed end.

Battle boxes and battle lockers containing first aid supplies and equipment are placed at accessible and strategic locations throughout the ship. These contain large battle dressings, small battle dressings, mild tincture of iodine U.S.P. application sticks, first aid packets, cotton, gauze bandages, gauze sponges, tincture of green soap, rubber tourniquets, web tourniquets, adhesive plaster, hand basin, tubes of tannic acid jelly, al-

cohol, chromic sutures, scissors, tweezers, safety pins, sterile sulfanilamide powder for dusting or sprinkling into cuts and wounds, morphine syrettes, splints, tongue depressors, head dressings and compresses, complete blood plasma set and paper tags, with pencil, upon which can be written important medical data.

Dental officers, medical officers and hospital corpsmen or pharmacist's mates are placed at various battle dressing stations and first aid stations throughout the ship. This not only insures accessibility to the wounded in the shortest possible time, but also guards against having the complete medical and dental complement knocked out by one salvo from an enemy ship.

In preparation for battle, all men are impressed with the importance of wearing their helmets and of not exposing themselves unnecessarily to the enemy's fire. They must have their gas masks and life jackets where they can get to them immediately.

For purposes of identification, each man wears a small metal tag around his neck upon which is stamped the name, rank or rate, service number, blood type and date of immunization to tetanus. The identification tag, the dental record and the fingerprints are the best means that we have of identification of the dead.

The dental record is inserted in the health record upon completion of recruit training, or of graduation in case of midshipmen. This record is prepared when each officer or man is first examined or treated, and each dental officer who examines or treats an officer or man is responsible for its completeness when it leaves his custody.

Upon it are charted all missing teeth, impacted or supernumerary teeth, carious teeth, types of restorations present, bridges, inlays, silver alloys, cement silicates, porcelain jacket crowns, etc.

To illustrate the importance of the dental record for purposes of identification: It was only a short time ago that several men were killed aboard a naval vessel by a torpedo from an enemy submarine. They were below deck when the torpedo struck, with no chance of escape. To save the ship, all compartments were closed off immediately to maintain water-tight integrity. It was several days before the ship was safely back in a Navy yard for repairs. By this time, the remains were in a very decomposed condition. Since some of the men were not wearing their identification tags at the time of the explosion, the only possible way to identify the bodies was by the dental records.

In going into battle, officers and men assume their battle stations as quickly as possible. Usually, the dental officer's battle station is located below deck at a battle dressing station or first aid station. Here also are several hospital corpsmen.

The dental officer knows that he will not play a spectacular rôle in the battle; that he may not even see the enemy. Here, he may give his life if the ship should be torpedoed and sunk or suffer a direct hit by bombs from enemy planes or salvos of shells from enemy ships. Nevertheless, temporarily, while the battle is on, he must remain at his station.

During battle everything can be heard and felt very plainly: The metallic, loud, "brroom-brroom" of the big guns as they roar out their defiance and death to the enemy; the lesser roar of the 5-inch guns firing possibly at the enemy destroyers or torpedo planes, and the ack-ack of the anti-aircraft fire as the enemy bomber and torpedo planes close in for the kill.

The ship swerves and lurches as she moves, swiftly, twisting and turning, first one way and then another, possibly to avoid torpedoes from submarines or torpedo planes. Bombers are overhead and are trying to lay their "eggs." This is the time when speed, maneuverability and an excellent captain, executive offi-

cer and navigator may go a long way toward saving the ship.

Minutes go by very slowly, waiting—waiting—waiting for a lull in the battle or a call from topside for a surgical team to render first aid and care for the wounded.

As these calls come through, the various surgical teams respond immediately. Passage is opened through the various compartments of the ship temporarily, in order that the surgical teams may get through to their objective. It is during these periods that the dental officers, medical officers and corpsmen are exposed to enemy shell fire and destruction.

Treatment must be rendered as quickly and effectively as possible. The fighting efficiency of the ship must be maintained at all cost. If this is not done, the ship and every one aboard will be lost. With this in mind, the men who can be treated and who can be returned to their battle stations immediately to carry on come first.

The seriously wounded are taken care of next. They are placed in as safe a place as possible and given morphine, and hemorrhage is arrested. Here they must remain until after the battle.

Immediately after battle, all casualties are assembled in a central area or station. The wardroom of the ship may be used for this purpose. From this area, those requiring immediate attention in order to save life are taken to the sick bay. Here, they receive all necessary treatment, and in case of severe hemorrhage and loss of blood are given plasma.

Normal human plasma has been responsible for saving a great many lives in this war that otherwise would have been lost. The standard Army and Navy package of normal human plasma, dried, is from volunteer donors enrolled by the American Red Cross. The package includes one bottle of desiccated normal human plasma to yield 250 cc. of restored plasma, to which has been added as a preservative 1:35,000 merthiolate (sodium ethylmercurithiosalicylate); one bottle containing 300 cc. of pyrogen-free sterile distilled water to which has been added 0.1 per cent sodium chloride, and one complete outfit for administration.

Patients requiring surgical measures to save life are operated on as indicated by the medical and dental officers as quickly as possible. Usually, many fracture cases follow a battle, being due to blasts and contact with fragments of metal, bomb and shell. These are indeed busy times for all hands, and it is seldom that any one in the H division gets any sleep for at least three or four days.

The dead must now be identified, cared for and given burial at sea. To do this quickly and effectively, working parties are organized from the ship's crew under supervision of a medical officer or a dental officer. All bodies are removed to a designated area and are prepared for burial. Here, they are identified by the metal tag worn around the neck or wrist, by oral examination and comparison with the dental record and by the taking of fingerprints.

If inclement weather follows a battle, it may be found practically impossible to take fingerprints on the weather decks, and extreme mutilation and destruction of the fingers may make it impossible to obtain fingerprints. It is at this time that the dental record becomes so important, since all casualties may not have worn identification tags.

After identification, the remains are placed in heavy canvas, weighted and sewed up by the ship's sailmaker. Burial at sea is something that one can never forget. These are the shipmates who have given their lives so bravely, and with whom we have served.

The body is placed on a table and covered with the American Flag. All officers and men who can be spared from their duties while underway are present to pay their last respects before the body is committed to the sea. The ship's chap-

lain reads a burial service for each man. Burial at sea is in complete accord with the wishes of most men of the sea. In fact, many officers and men have requested and have received permission to be buried at sea, whether they are serving on land or sea at the time of death.

As soon as the ship has reached the base from which she is operating, casualties that can be transferred are moved either to a hospital ship or to a base hospital. Here, they can be taken care of more satisfactorily, since aboardship there is a great limitation of space.

The ship, if she has suffered damage, is placed in fighting condition again as quickly as possible. Officers and men are transferred from the operating base to the ship to fill the positions left vacant by the fighting men who have carried on before them.

It is these men who are so proudly protecting our homes, in order that our families and loved ones may live, as we have known life, in the American Way!

U.S.S. South Dakota, c/o Postmaster, New York, N. Y.

MICROSTRUCTURE OF TOOTH SURFACES AS REVEALED BY THE ELECTRON MICROSCOPE*

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THE preliminary report concerns a study, begun in July 1943, of the structure of human teeth as revealed by electron micrographs of tooth surfaces. The report illustrates the results obtained when this technic is applied to the study of dentin. A more thorough study of dentin of various ages and locations and of the other tooth structures is under way and will be reported when completed.

The electron microscope has been used successfully in other fields, such as bacteriology, physics and metallurgy, and the extension of its application to the field of dentistry follows in a logical sequence. A brief description of the electron microscope[1] is in order. This instrument can best be described by means of an analogy with the optical or light microscope. With both types of microscope, a beam of radiation passes through the specimen to be studied and then magnifies the emergent beam by means of a system of lenses until a highly magnified image is produced. This image may then be observed visually or recorded photographically for future study.

The ordinary optical microscope employs white light as its form of radiation, while the electron microscope uses a beam of electrons. The optical microscope uses glass lenses and the R.C.A. electron microscope used in this study has magnetic lenses.

The electron beam differs markedly from the light beam in two respects: First, the electron beam is invisible to the human eye; hence, a fluorescent screen is used to render visible the en-

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larged invisible electron image of the specimen. Second, electrons are easily stopped by molecules of air, while light encounters little resistance from them. Because of this difficulty, the electron microscope is constructed so that the path along which the electron beam passes, the specimen, the fluorescent screen and the photographic plate are all kept in a high vacuum. Because at present the specimen is subjected to a high vacuum, it is obvious that only dehydrated and degassed specimens can be investigated in the electron microscope. Perhaps, in the future, new methods and apparatus will be available so that

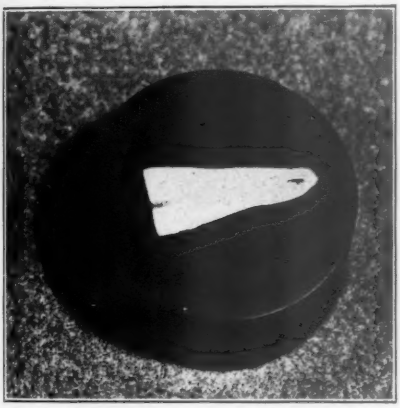


Fig. 1.—Tooth mounted in bakelite and ground to desired surface.

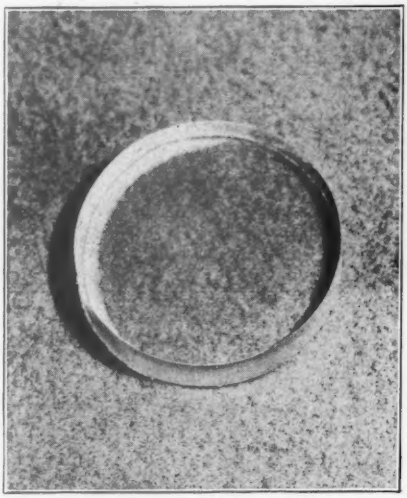
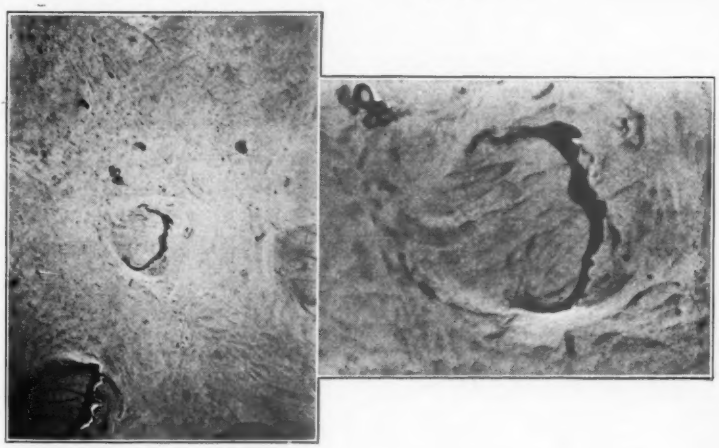


Fig. 2.—Piece of polystyrene bearing tooth surface impression.



A B

Fig. 3.—a, electron micrograph. (×6,000.) b, structure at center of a. (×22,000.)

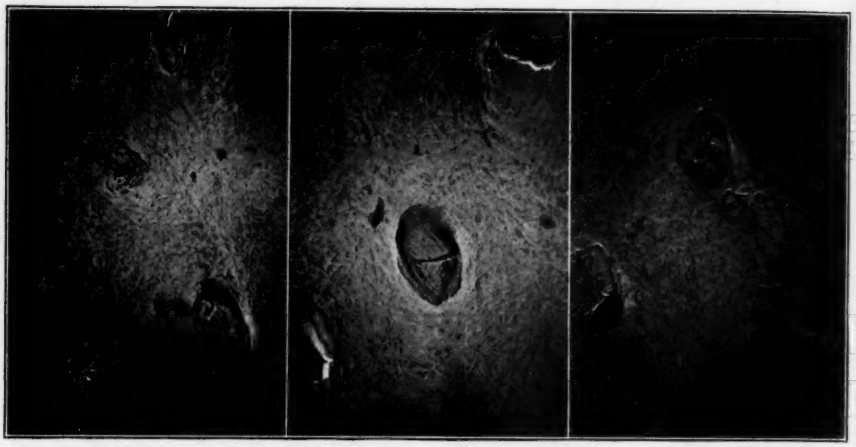
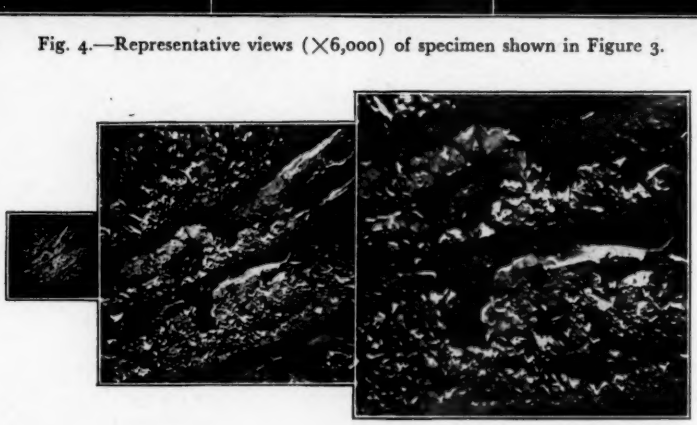


Fig. 4.—Representative views (×6,000) of specimen shown in Figure 3.



A B C

Fig. 5.—Section of dentin from fractured cuspid (a, ×1,200; b, ×2,800; c, ×6,000).

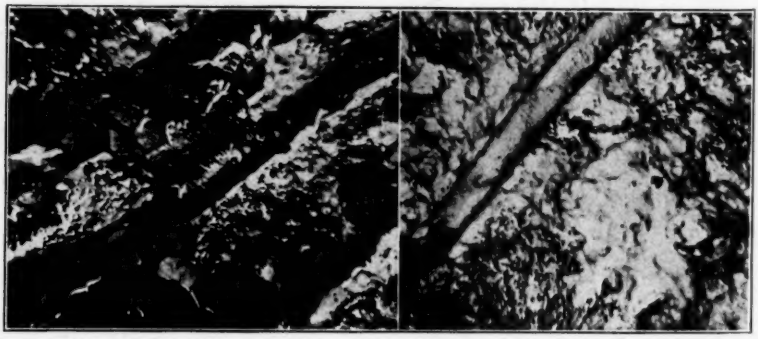


Fig. 6.—Representative views (×6,000) of specimen shown in Figure 5.

hydrated specimens can be viewed.

Light and electron beams are alike in that both affect photographic emulsions. When the image of an interesting portion of the specimen is revealed upon the fluorescent screen in the electron microscope, it can be permanently recorded by merely substituting a photographic plate for the fluorescent screen.

Since the electron beam is stopped so easily, even by air molecules, it is at once realized that only very thin specimens can be used in the electron microscope. A suitable specimen should be about 1,000 Angstrom units or less in thickness, an Angstrom unit being equal to 0.0001 micron or 0.00001 cm. In bacteria or particle-size research, the specimen itself can be supported on a thin film of collodion and placed directly in the electron microscope, but this is impossible for a calcified tooth because no sectioning method, known to us, is capable of producing sections of calcified tooth structures of the desired thickness. Therefore, an indirect method of specimen preparation must be used.

The method of specimen preparation used in this investigation is an adaptation of a method developed by Heidenreich and Peck[2] for the study of the surface structure of metals. The technic herein described consists of first preparing the tooth surface that is to be studied. One method is to fracture the tooth in the plane or surface that is to be studied. Another method is to mount the tooth in a block of bakelite, using a temperature of 135° C. and a pressure of 3,500 pounds per square inch, and then grind off the tooth and bakelite until the desired surface of the tooth is reached. (Fig. 1.) Next, this tooth surface is carefully polished, the final polish being obtained by using four-zero metallographic polishing paper. The tooth is then etched in 5 per cent hydrochloric acid for about sixty seconds in order to reveal the structure of the dentin. It is entirely possible that other etching reagents would reveal the dentin structure differently.

An impression of the fractured or etched surface is next made in a thermoplastic resinous material, polystyrene, at a temperature of 160° C. and a pressure of 2,000 pounds per square inch. The tooth in its bakelite mounting is then separated from the plastic material (Fig. 2) and the tooth is discarded. The plastic, bearing the impression, is placed in a silica evaporator. A quantity of silica (3 mg. for the particular equipment used in this investigation) is placed in a tungsten filament that is 6 cm. directly below the piece of plastic bearing the tooth surface impression. The air is exhausted from the evaporator until a vacuum of 10^{-5} mm. of mercury is reached. A current of from 19 to 20 amperes is passed through the tungsten filament, heating it to a bright incandescence. The silica quickly evaporates and condenses on the walls of the evaporator and on the piece of plastic bearing the tooth impression. After forty-five seconds, the current is turned off, since the evaporation is complete and a thin film of silica of proper thickness has condensed on the plastic. The plastic is removed from the evaporator, and the silica film is removed mechanically from all surfaces of the plastic except the one bearing the impression of the tooth. The film on this remaining surface is approximately flat on one side and faithfully follows the impression of the tooth on the other. This silica film has the same surface characteristics that the etched tooth had originally and is of proper thickness to be used as specimen in the electron microscope. The film is freed from the plastic material by dissolving the plastic in ethyl bromide. From this point on, the specimen (silica film) is supported on a circular piece of 200-mesh screen of one-eighth inch diameter. Only a small fraction of one opening in the 200-mesh screen can be magnified at one time. Thus, many adjacent pictures can

be taken, all within one screen opening.

Figure 3, a is an electron micrograph (×6,000) of a polished and etched surface of dentin from a mature lower right cuspid. The tooth surface involved in this instance was a plane running parallel to the long axis of the tooth. The surface was about 2 mm. away from the pulp chamber.

Figure 3, b shows the structure that appears in the center of Figure 3, a, but at a magnification of ×22,000.

Figure 4 presents representative views (×6,000) of the same specimen as Figure 3.

Figure 5, a shows a section of dentin from a fractured mature upper right cuspid at ×1,200. Figure 5, b shows the same area at ×2,800 and Figure 5, c at ×6,000. The plane in which this tooth fractured passed directly through the long axis of the tooth. Only the coronal third of the tooth was used.

Figure 6 presents representative views (×6,000) of the same specimen as Figure 5. It was noted that the broad lines shown in the illustrations all had the same approximate slope and that some of the lines could be followed from one side of an opening in the 200-mesh screen to the opposite side of the opening. The tooth surface illustrated in Figures 5 and 6 was neither altered mechanically nor subjected to any chemical action, so that the broad lines were not created artificially.

The teeth used in this study were dried teeth of unknown age and origin. After extraction, they had been boiled in a solution of Gold Dust soap, bleached in a sodium hypochlorite solution, washed and dried. The fact that a particular specimen was taken from an uncertain area of the tooth surface is not of prime importance in this study because no attempt has been made to identify dentin structures, but only to illustrate the technic.

These electron micrographs indicate that the technic herein described is applicable to the study of the microstructure of dentin and can easily be extended to include other tooth structures and opaque dental materials.

BIBLIOGRAPHY

1. BURTON, E. F., and KOHL, W. H.: Electron Microscope. New York: Reinhold, 1942.
2. HEIDENREICH, R. D., and PECK, V. G.: Fine Structure of Metallic Surfaces with Electron Microscope. *J. Applied Physics,* 14:23-29, January 1943.

MEDICINE AND SURGERY IN THE TIME OF THE BIBLE AND THE TALMUD

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IN these modern times, the practice of medicine is regulated and health laws are enforced by the state. In ancient times, most laws were made and enforced by the church, and were an integral part of religious practice. Such laws became "A Way of Life" among the Jewish people; hence, we see recorded in the Bible and the Talmud a well-regulated system of laws, including health laws, which are practiced by many even at the present time. These laws are termed "Laws of Purification and Laws of Sanctification," elaborately described in the book of Leviticus. The transgressors of these prescribed laws were liable to punishment according to the manner laid down, and the laws were administered by the Ecclesiastic Courts.

Among the essentials for a well-cared body is cleanliness. Washing of the hands before touching any food was a strict regulation. "Sanctify yourselves and be ye holy." (Lev. XI, 44.) These words have reference to washing of the hands before, as well as after, the meal. (Ber. 53b.) Whoever eats bread, meaning also any other food, without scouring his hands is as though he eats unclean bread. (Sota 4b.) A person who despises washing his hands before meals is to be excommunicated. (Sota 19a.) There is even a benediction prescribed for the purpose.

Cleanliness also applies to vessels used during the meal. "Rinse the cup before drinking and after drinking." (Tamid 27b.) A man should not drink from a cup and hand it to his fellow because of the danger to life. (Der. Eretz IX.) Washing the hands must also be performed upon rising from bed. To omit doing so was considered to be injurious to health. Such unwashed hands make the eye blind, the ear deaf, and cause polypus. (Shab. 108.)

It was forbidden to live in a city in which there was no bathhouse. (Kid. 66d.) The bathhouse provided a vapor bath, and the perspiration it caused was considered wholesome. "There are three types of perspiring which are beneficial to the body: the perspiration caused by illness, the bath and exertion. The one caused by illness is curative and as for that caused by a bath, there is nothing to equal it." (Arn. XLI.) To obtain the best results, a hot bath must be followed by a cold douche. (Shab. 41a.) Cleanliness was advocated as the best preventive of disease. "Better is a drop of cold water in the eyes in the morning, and the washing of the hands and feet in the evening, than all the eye salves in the world." (Shab. 108b.) "Uncleanliness of the head leads to blindness, uncleanliness of clothes leads to insanity, uncleanliness of the body leads to ulcers and sores, so beware of uncleanliness." (Ned. 81a.) The proper treatment of a body is to bathe it in hot water and to rub it with oil. (Yoma. 78b.) The Talmud warns of the importance for regular purgation. "If the fecal discharge is kept back it causes dropsy, and if the fluid in the urinary duct is kept back, it causes jaundice." (Ber. 25a.)

It was believed that "if the blood becomes abundant, skin disease becomes abundant." (Bech. 44b.) The process of cupping and blood-letting was advised. The after-effect of the operation

is lowered vitality, and a person must be careful and should take nourishing food to invigorate himself.

With cleanliness is combined moderation of diet as prerequisite to a healthy condition. The general rule is prescribed: "Eat one third of the capacity of the stomach; drink one third, and leave one third empty." (Git. 70a.) The right time to take food is whenever the need is felt. "While you are hungry eat, while you are thirsty drink." (Ber. 62b.) R. Akiba advised his son: "Rise up early and eat in the summer on account of the heat and in the winter on account of the cold." "A meal should be taken sitting, because to eat or drink standing shatters the body of a man." (Git. 70a.) "When a person is traveling the quantity of food consumed should be reduced." (Tan. 10b.)

Moderation in all things is the rule. "Do not sit too much because it is bad for piles; do not stand too much because it is bad for the heart; do not walk too much because it is bad for the eyes, but spend one-third of the time sitting, a third standing, and a third walking." (Keth. 111a.) The need for rest through sleep is recognized. "Night was created for sleep," declared a rabbi. (Erub 65a.) "Sleeping at dawn is like a steel edge to iron," said another (Ber. 62b.), meaning thereby that it is health-giving and invigorating. On the other hand, "Morning sleep puts a man out of the world" (Aboth. 111, 14), and a man is forbidden to sleep during the daytime. The rabbis believed that it was impossible for human beings to live without sleep for three consecutive days. "If a man says I will not sleep for three days, he is castigated and must sleep forthwith" (Ned. 37b), because he has made a vain oath which is impossible in fulfilment except with fatal consequences.

One should live in a clean environment and the law forbade anything to be done which would be detrimental to the town. A typical regulation. "A permanent threshing floor may not be erected within fifty cubits of a city." The place for depositing carcasses, a cemetery, may not be erected within fifty cubits of a city. The purpose is to safeguard the inhabitants from dust and offensive odors. The importance of diet in the preservation of health was recognized.

The Talmud has many passages which treat of articles of food that are wholesome or otherwise. Great stress is laid on the advice that to derive the fullest benefit from eating bread, salt must be added to it and water drunk after it.

There are eighty-three diseases connected with bile which can be counteracted by eating bread with salt in the morning and drinking a jug of water. (B.K. 92b.)

Meat was regarded as a luxury and must have been seldom tasted by the poorer classes. Some vegetables are recommended as more beneficial than others. A fish diet is considered to be very healthful. For its size, the most nutritious of all food is the egg, if meat be excluded. It is dangerous to leave foodstuffs exposed overnight. Dates give heat to the body, satisfy, act as a laxative, strengthen and do not weaken the heart. (Keth. 10b.)

Among the Jews, unlike other primitive nations, the priests did not monopolize the art and science of healing. Moses assigned to them its supervision in cases of contagious diseases. Some of the prophets practiced the art of healing. Elijah brought to life a child apparently dead. (I Kings, xvii, 17-22.) His disciple Elisha performed a similar miraculous cure. (Kings IV, 18, 20, 34-35.) A man of God restored the paralyzed hand of King Jeroboam. (Kings XIII, 4-6.) Isaiah cured King Hezekiah of an inflammation by supplying a plaster made of figs. (II Kings, XX-7.) Physicians were held in high esteem by the people as may be gathered from Ben Sira, "Honor your physician with the honor due unto him for the uses which

ye may have him, for He created him." The court of justice employed in certain cases the services of a physician (Rofe), whose expert testimony was decisive in criminal matters. In cases of assault, it was his duty to give his opinion as to the danger to the life of the assaulted. (Sanh. 78a. Git. 12b.) Corporal punishment was inflicted under the supervision of a physician. (Mak. 22b.) No physician was permitted to practice without license from the local judicial court. (BB 21.) Every city was required to have at least one physician; and to live in a city that had none was considered hazardous. (Sanh. 17b.)

The medical knowledge of the Talmudists was based upon tradition, the dissection of human bodies, observation of diseases and experiments upon animals. (Hul. 57b.) When making the rounds, physicians used to take their apprentices with them. In the majority of cases, the art of healing was transmitted from father to son. (Yer. 2, 3, 57b.) The sum of medical knowledge possessed by the ancient Hebrews cannot be stated definitely, for the reason that neither the Bible nor the Talmud contained medical treaties as such. The Mishna mentions a medical book, "Sefer Refuot," which was attributed to King Solomon. The Talmud speaks of a treatise on pharmacology, "Megillat Sammaim." (Yoma 38a.) Neither of these books has been preserved. Medicine was an integral part of the religion of the Jews and medical subjects are treated of or alluded to only so far as they concern or elucidate some point of law.

There are in the Bible but few direct references to internal organs. Biblical poetry abounds in expressions in which the names of organs are used metaphorically. The laws concerning clean (Tohorah) and unclean (Tumah) afford means for ascertaining, in part, the familiarity of the ancient Hebrews with certain branches of anatomy. According to Mosaic law (Num. XIX. 14), any one who comes in contact with a dead body or part thereof, or who remains in a tent wherein a corpse is found, is considered unclean for seven days.

The Talmud (Oh. I. 8) gives the number of bones in the body as 248, and the following bones are recognized and named: hand (pissat ha-yad), 30; forearm (kaneh), 2; elbow joint (marpek), 2; arm, 1; shoulder joint (kataf), including shoulder blade (kanaf), 4; foot (pissat ha-regel), 30; ankle joint (arkub), including head of femur (buka deitma) and innominate bone (keliboset), 3; spinal column (shel-leb), 6; sacrum and coccyx (ukaz), 6, and head, 9, in which were recognized the vertex (kederah), 2 condyloid processes, foramen magnum, fontanels, maxillary bone, maxillary arch (gabbot ha-zakon) and nasal bone (ezem ha-hotem).

The Bible speaks of muscles under the general term of "flesh" (basar). The abdominal muscles are mentioned in Job XL, 16. The psoas muscle is mentioned in the Talmud (Hul. 93a), and Rab Hisdai made the remarkable observation that the psoas in all clean animals, i.e. those that chew the cud and whose hoofs are cleft, has two accessory muscles whose respective fibers run longitudinally and transversely. (Ibid. 59a.) Tendons are frequently mentioned under the term "giddim." The salivary glands or "fountains" (Niddah 55b) are situated in the oral cavity (AB.R.N. XXXXI) and under the tongue. (Lev. R. XVI.) The capacity of the pharynx (bet ha-beliah) was found by experiment to be larger than it seems. A hen's egg can be easily swallowed whole. (Yoma 80a.) The esophagus (weshet) and larynx (kaneh) have their respective origins in the pharynx. The structure of the esophagus is composed of two layers (orot), an outer, muscular one and an inner, serous one. (Hul. 43.) The inner layer has longitudinal folds throughout its length except at the upper part, which is called tarbez ha-veshet. (Ibid.

43.) The lower portion of the inner layer is supplied with hairlike projections. (8b. 44.) The larynx (kaneh, gargeret) is composed of a large ring of cricoid cartilage (tabaat gedolah), thyroid cartilage (koba, pikah shel gargeret) and the epiglottis (shippuy koba). (Hul. 18b.) The trachea is composed of incomplete cartilaginous rings (hulyot) and membranous ones (bene hulyah). The alimentary canal of ruminating animals is thus described: The food passes from the mouth into the larynx, thence into the esophagus (istomka), thence into the reticulum (bet hakosot), thence into the psalterium (hamasas or hemses), thence into the abomasum (karsa), thence into the duodenum (resh maya), thence into the small intestines (keruka kattinah), thence into the blind gut (sanya debe), thence into the large intestines (kerukit'ubya) and thence into the rectum (petaroka), whence it makes its exit through the sphincter ani (iskutha). (Lev. L.R. III.)

The gastro-intestinal tract, throughout its length, is covered externally with the peritoneum (kerumniklaf), except the posterior surface of the lower portion of the rectum (hilholet). (Hul. 49b.) The peritoneum forms the greater omentum (peder), which is attached to the greater curvature or "bow" (kashta) of the stomach (ibid. 50a) and the beginning of the small intestines. (Ibid 93a.) The liver is attached to the diaphragm (tarpesha) by a fold of the peritoneum. (Ibid 46a.) It is also united with the gallbladder (marah) by means of a narrow tube (simpona). (Ibid 48b.) The pancreas is considered an accessory organ of the liver and is called the finger of the liver (ezba'hakabed). Its relation to the abdominal organs is described correctly. (Tamid 31a.) The spleen and kidneys are frequently mentioned in the Talmud and Midrash, but no description is given. The lungs are composed of two rows (arugot), right and left, divided vertically by a septum which rises from pericardium (kis haleb) attached to the spinal column. The large bronchi (bet ha-simponot) enter, respectively, the inner side of each row. (Ibid 50a.) Alongside the bronchi enter the large blood vessels (mizrakim). (Ibid 47a.)

The number of lobes in each lung is given correctly. (Ibid 47a.) The pleura is composed of two layers, an outer, rough one (kerama illaya), and an inner rose colored one (kerama tattaa, kittuna de-warda.) (Ibid 46a.) The heart is composed of two ventricles (halal), the right being larger than the left. (Ibid 45b.) It is situated to the left of the median line. (Men. 3ub.) Rab expressed a radical view for this time; namely, that the aorta (kaneh shel-leb) contains blood, not air. (Hul. 45b.) The large veins are called "veridim"; the small ones, "hute dam." The brain is not mentioned in the Bible. According to the Talmudists, it has two coats, an outer (the dura mater) and an inner (the pia mater), the one being hard (kashkish), the other thin (dakdik), the spinal cord being outside of the condyloid process. (Hul. 45a.) The Zohar gives a somewhat more detailed description. The skull contains three cavities in which the brain is lodged. From the brain issue thirty-two paths. These paths spread over the body connecting it with the brain. (Zohar on Lev. XXII.)

From the laws relating to circumcision, flux, menstruation, etc., which are discussed at length in the Bible and especially in the Talmud, may be gathered some idea of the knowledge that the ancient Jews possessed concerning the anatomy of the generative organs. Of the male genitals, the anatomic parts are mentioned as follows: the scrotum (kis) is divided by a septum into two sacculi. (Bek. 40a.) The testes (bezim ashakim) have two coats. (Hul. 45a.) Each testicle has an appendix, the epididymis (hute bezah) (Yeb. 75a), with blood vessels (gide pahad) (Hul. 93a) and nerves (Ibid 45b), and containing a viscid fluid. (Yeb. 75a.) It was held

that the spermatic fluid and the urine had each a separate canal for exit. (Bek. 44b.) Besides the uterus, only the visible of the female generative organs (rehem), there being many synonyms, are mentioned in the Bible. The Talmud mentions the following: mons veneris (Hebrew, kaf tappuah) (Yer. Yeb. 1-2); vulva (erwah), rima pudendorum (bet ha-setarim) (Niddah 66b); vestibulum vaginae (bet hizon) (ibid. 41b); orificum urethrea (lul) (ibid. 17b); hymen (betulim); ostium vaginae (bet shinnayim) (ibid. 46b); vagina (bet toref, bet harehem) (Shab. 64a); septum vagina-rectalis (karka prosdor) (ibid.); canalis cervices uteri (makor) (ibid. 41a); cavum uteri (heder) (ibid. 17b) (bet herayon) (Ar. 7a).

According to Mosaic law (Lev. XII, 2-5), a woman after giving birth to a male child remained unclean for seven days; in the case of a female child, fourteen days. Then followed a period of purification for a male child thirty days and for a female sixty days. According to the Mishna, miscarriages fell under the same law, provided, however, the fetus (shefir) was completely formed (merukkam) and the features were well differentiated (mi-zorat adam).

Monstrosities and all fetuses not viable were exempt from the above-named law (Niddah III.) This interpretation of the Biblical law served as an impetus to the Talmudists for the diligent study of embryology. Rabbi Samuel, it is said, was able to tell the exact age of the fetus. (Niddah 25b.) The fetus, it was held, is completely formed at the end of the sixth week. He contended that it was impossible to differentiate the sex before the end of the fourth month, which, by the way, is the opinion of modern embryologists. At certain necropsies, it was found that the male embryos were completely formed at the end of the eighty-first day. The rabbis contended that the necropsies had not been free from error. (Niddah 30b.) The soft parts are formed, then the bones. (Gen. R. 14.) Monstrosities, afflicted with cyclopia, monopsia, a double back with double spinal column, atresia aesophagi (weshet atum), etc., are mentioned. (Niddah. 23b, 24a, b.)

The Bible identifies the blood with the soul as the essential principle of life. (Gen. IX. 4.) (Hul. 125a.) The relation between strength and the development of muscles is mentioned in the Bible. (Job XI. 16.) The Talmudists noted the fact that the muscles change their form when in motion. (Hul. 93a.)

Respiration is compared to burning. Expired air cannot sustain life. (Sanh. 77a.) The life of all the organs of the body depends on the heart. (Yer. Ter. VIII, 4.) Each gland secretes a fluid peculiar to itself, although all the glands derive their material from the same source. (Num. R. XV.)

The differences in the structure of the teeth in herbivorous and carnivorous animals is noted. (Hul. 59.) Saliva, besides moistening the tongue, is an aid to the palatability of food. (Num. R. IV.) The stomach performs a purely mechanical function, that of churning the food. It is compared to a mill. Digestion proper (ikkul) is carried on in the intestines. The time occupied in digestion is not the same in all individuals. The end of the digestive period is made manifest by the return of a desire for food. (Bek. 52b.) Eating when the bowels are full is likened to making a fire in a stove from which the ashes have not been removed. (Ibid. 55a.) Normal defecation hastens digestion. Birds digest their food rapidly. (Shab. 82a.) Dogs digest theirs slowly. (Oh. XI, 7.) The reasoning faculties are lodged in the brain. (Yeb. 9a.) The movements of the body depend on the integrity of the spinal cord. (Hul. 58.) Rabbi Isaac holds that the liver elaborates blood. (Shab. 82.)

There are numerous references to the influence of climate, customs, trade, etc., upon the development of the organism as a whole, and upon certain groups of

muscles. (A.R.N. XXXI; Yeb. 103a; M.K. 25b.) The phenomena of menstruation are described in detail. (Niddah XI, 8.) The menstrual fluid is considered by Rabbi Meir as an extra nutritive material which is discharged periodically when of no use, but which is converted into milk during the period of lactation. (Ibid.) Absence of menstruation indicates sterility. Fear and cold may arrest the flow. (Ibid. 66.) That medicine was an integral part of religion of Israel is made more evident from the pathologic studies of the rabbis than from any other branch of medical science.

It is indeed remarkable that the rabbis seem to have been the first to recognize virtually what is at present the prevailing theory; namely, that the symptoms of all diseases are merely outward manifestations of internal change in the tissues—a theory never advanced by their contemporaries, e.g. Hippocrates and his disciples, and only vaguely hinted at by Galen. Their pathologic studies were a direct outgrowth of the law concerning the "flesh that is torn of beasts in the field," which becomes unfit (terefa) for food. (Ex. XXII, 30, A.V. 31.)

Certain rules concerning this infection are enjoined upon those who came in contact with the flesh of the animal that "died of itself or is torn by beast." (Lev. XXII. 8.) The Talmudists went a step farther, declaring that the word "unfit" includes the flesh of animals with any disease which would have sooner or later caused the death of the animal. (Hul. III. i.) In order, therefore, to determine the condition of the internal organs, each slaughtered animal was subjected to a necropsy. This is the practice even today. The pathologic changes in the lungs have been most diligently studied as to color, consistency, cavities and vegetable growths.

Redness of the lung indicates hyperemia (Hul. 49), a condition that is not fatal. (Ibid. 46b.) Blueness and lightness from discoloration are not considered dangerous. (Ibid. 47b.) Blackness indicates that the object has begun to disintegrate (lakah) and the part of lungs thus affected cannot return to the normal state. Bright yellow (yarok) is considered as indicative of fatal conditions. If, in inflating the lungs, it is found that the air does not enter a certain part of them (otem bereah), it is then important to find out whether the obstruction is caused by pus or mucus (mugla) in the bronchi, which might have been expelled by coughing, or is due to thickening of the tissues. In the latter case, the animal is unfit for food. Caseous degeneration (reah she-yabeshah), in which there is no blood and the tissue crumbles under the nail, "makes the flesh of the animal unfit for food." Softening of the lung (reah she-nitmasmesah) is fatal. In the case of an animal with collapsed lungs (reah she zamekah), the following rule is given by the Talmud: If after they have been immersed in water, they can be inflated with air, the flesh of the animal is fit to eat; if they cannot be so inflated, it is unfit. A pitcher-shaped cavity in the lungs (reah she-nishpekah ke-kiton) filled with fluid renders the animal unfit to eat. An empty cavity (reah she-nishpekah ke-kiton) filled with the fluid renders the animal unfit for food. An empty cavity (reah she-nimmokah) is not dangerous to life. (Ibid.)

The rabbis speak of vegetable growths (zemahim) on the lungs in connection with adhesion of the lung to the thorax (dofen), and they describe several forms, all of which are not considered dangerous. Perforation of the outer coat of the brain is not fatal, but the slightest perforation of the inner coat is. Rabbi Jacob held that injury of the spinal cord is fatal. The editor of the *Mishna* said that it is fatal only when the injury extends more than one half of its transverse diameter. (Hul. III.) The condition of a sheep that dragged its hind legs was diagnosed by Rabbi Yemar as ischagra (shigrona), but Rabina contended that

it was paralysis due to a solution of continuity of the spinal cord. The sheep was killed and the diagnosis of Rabina corroborated. (Hul. 51a.) This is the only case on record in ancient literature in which a diagnosis was made during life and verified at a postmortem examination. Rabbi Levi saw one who suffered from tremor of the head, and he remarked that the man was suffering from softening of the spinal cord. Abaya said that such cases were not fatal, but the patients lost their productive functions. (Ibid.) Perforation of the heart was considered fatal. No other pathologic changes of the heart are mentioned. A transverse division of the trachea is not considered fatal provided it is less than half of its circumference. Longitudinal wounds in the trachea heal quickly. (Ibid. 45a, 54a and 57b.) Loss of substance is considered fatal since the food may escape into the mediastinum. (Ibid. 45b.)

Volvulus is considered fatal. (Ibid. 56.) Perforation of the stomach or the intestines is fatal. Extirpation of the spleen in animals and in man is not considered fatal. (Hul. 2.) Rupture or wounding of the spleen is considered fatal. Ablation of the uterus is mentioned and is not considered fatal. (Bek. VI-4.) Atrophy and abscess of the kidney are considered fatal. (Hul. 55a, b.) Accumulation of transparent fluid in the kidney is not believed fatal. (Ibid. 53b.) The pathologic changes in the liver mentioned in the Talmud are: that in which the organs become dry and bloodless and "crumble under the nails"; abscess, and stonelike hardening. Extirpation of the liver is not considered fatal if there is left intact the part which surrounds the biliary duct and "that place from which the liver receives its vitality." Absence of one testicle is mentioned, and the subject is considered sterile. (Bek. VI. 6.) Hypertrophy and atrophy of the testicles (Ibid. 40b), scrotal hernia (ruah baashakim) and elephantiasis scroti (meushkan) (ibid.) are also mentioned. Various forms of hypospadias and epispadias are described. (Niddah 13a; Yeb. 76a.) The Mishna enumerates 140 pathologic conditions having which, in the eyes of the law, man is a cripple (mum) and therefore unfit to perform any religious service in the temple.

Fifteen of these describe various osteologic deformities of the head, spine and extremities. (Bek. VII.) The rare case of individuals having a tendency to hemorrhage are related and the fact that this affection is hereditary is noted. (Yeb. 64b.) Wounds in different parts of the body, caused by different weapons, sword, hammer, etc., are mentioned in the Bible. (II. Sam. 23, Num. XXV. 8, Judges III. 21, V, 24, Kings I, Chap. XXII, 34; Chron. II, Chap. XXXV, 23, etc.) Inflammation and abscesses are mentioned. (Deut. XXVIII. 27, 35.) Gangrene and putrid discharges are also mentioned. (Ps. XXXVIII. 6, Prov. XII, 4, XII, 30.)

Wounds were treated by the application of wine or oil, bandages or sutures. (Is. I. 5; Jer. VIII, 22; XLVI, 11, LI, 8, Deut. XXVIII, 27.) The surgical operations mentioned in the Bible are circumcision and castration, the latter being prohibited. (Deut. XXIII, 1.)

During the Talmudical period, surgery attained a high degree of development. Many physicians devoted themselves exclusively to it. Surgeons (ummanim) (Sanh. 91b), when operating, used to wear a tunic over their dress. (Kelim XXVI-5.) They used various surgical instruments. (Ibid. XIII-2.) In major operations, the patients were given an anesthetic or a sleeping potion (samme de-shinta). (B.M. 83b.) Venesection was extensively used upon the healthy and the sick alike.

After the age of 50, venesection should be employed less frequently. (Git. 70a.) It is not to be performed during inclement weather; and a careful dietetic régime should be followed, for some time after the operation. (Shab. 129a.) Bleeding by means of leeches (Alukah,

nimeshel mayim) (Ab. Zorah 12b) and by means of cupping is frequently mentioned. Dislocations of various joints (Ab. Zorah 29), fractures, amputations (Ker. 66a; Sem. 28, Shab. 66a) and trephining (Ket. 77b) are discussed in the Talmud.

Artificial teeth made of wood, gold or silver were used. (Shab. 65; Ned. 66b.) Extirpation of the spleen was successfully performed upon man. (Ab. Zorah 44a.) Intubation of the larynx was practiced upon animals, the tube being called "kerumit shel kaneh," and a plate (hidduk shel karweyah) was used in a case of loss of substance of the cranium. A uterine speculum was used. (Niddah 66.) The practice was adapted for freshening the borders of old wounds in order that union might be effected. (Hul. 77.) The operation for imperforate anus in the new born is described. (Shab. 134b.) Wounds exposed to air do not heal so readily as protected ones. (Hul. 46.) Nasal polyps are said to cause *fetor ex ore*. (Ket. 77.) Crutches and various other orthopedic appliances are mentioned. (Shab. 65a.) Intestinal parasites and hydatids are frequently mentioned. (Hul. 48a.) Extraction of the fetus through an incision made in the abdomen was an operation known to the Talmudists. (Niddah 40b.)

BIBLIOGRAPHY

BERGEL, J.: Die Medizin der Talmudisten, 1885.

EBSTEIN, W.: Die Medizin in Alten Testament, 1901.

BITTING, W. C.: Biblical Medicine. New York Medical Society, 1931.

COHEN, A.: Everyman's Talmud. London: J. M. Dent & Sons, Ltd., 1931.

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A COMMON DENTAL MORPHOTROPIC FACTOR THE CARABELLI CUSP

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THE diminutive cusp that frequently surmounts the lingual surface of the mesiolingual cusp of the maxillary first molar, at the junction of the middle and occlusal thirds of the crown, was originally described by Carabelli more than a century ago. Many years later, G. V. Black was the first to regard its appearance as a hereditary trait.

Diamond[1] states that "this fifth lobe is entirely absent in about fifty per cent of the upper first molars and is always bilateral when present." Wheeler[2] asserts that "the fifth cusp or traces of it may be used as an unfailing identification mark in establishing the identity of the maxillary first molar."

While observing the cusp of Carabelli in numerous casts that were made from hydrocolloid impressions from the Army personnel, I was especially impressed with the unvarying concomitant appearance of a dominantly square typal form of maxillary central incisor whenever this fifth cusp was present. These preliminary observations led to the formulation of a definite plan of procedure.

EXPERIMENTAL DATA

Material.—From more than 6,000 stone casts of the upper arch, 1,000 were

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chosen which presented at least the minimum requirements, as follows:

1. One intact, central incisor, classificatory as to a distinctly dominant typal form.

2. One first molar the mesiolingual cusp of which was not subjected to attrition, caries, fracture or instrumental intervention.

Method.—First, the typal form of the central incisor was determined as square, tapering or ovoid according to the method of James Leon Williams.[3] Berry[4] and Williams[5] have definitely established the fact that the maxillary central incisors are the most important teeth for study from the standpoint of classification.

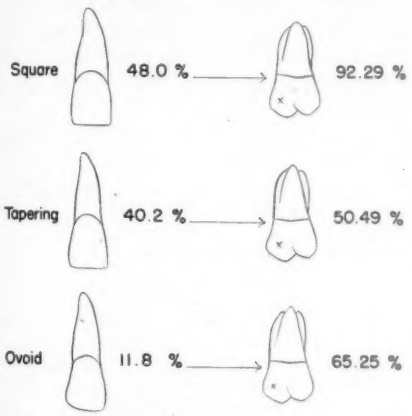

Fig. 1.—Occurrence of typal forms of maxillary central incisors in 1,000 selected cases. (Left side of illustration.) The frequency of occurrence of the cusp of Carabelli in conjunction with the typal forms is shown at the right. X, locus of cusp of Carabelli.

If the central incisors did not dominantly conform to any of the three typal forms, the cast was not included in this study. The criteria for the determination of the pure typal forms as established by M. M. House[6] were rigidly followed.

Then the cusp of Carabelli was, if present, classified as to type and as to the degree of development.

RESULTS

Figure 1 shows that of 1,000 casts of pure typal forms, 48 per cent exhibited, definitely or dominantly, the square typal form of central incisor and 40.2 per cent of the central incisors were, definitely or dominantly, tapering. Ovoid central incisors were seen in only 11.8 per cent of the casts.

It is further shown that in all casts presenting the square central incisor, the cusp of Carabelli was expressed in one of its four types 92.29 per cent of the time.

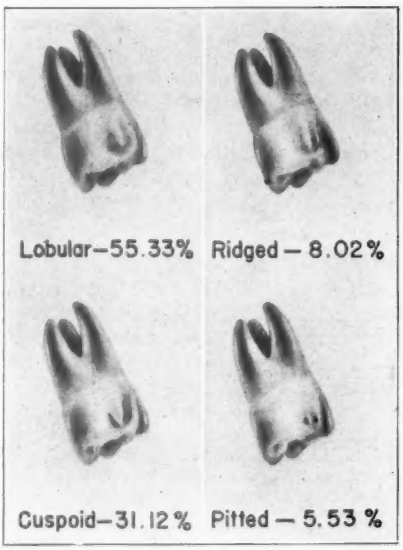

Fig. 2.—Four types of cusp of Carabelli and their respective incidence in 723 casts.

When the central incisor was the tapering type, the cusp of Carabelli occurred in only 50.49 per cent. The cusp of Carabelli was present in 65.25 per cent when the central incisors were ovoid.

As shown in Figure 2, four types of the cusp of Carabelli were found, of which 55.33 per cent were lobular, 31.12 per cent cuspoid, 8.02 per cent ridged and only 5.53 per cent pitted. A mere classification as to the type of cusp of Cara-

belli is valueless if its degree of development is not also included. The further breakdown shown in Figure 3 reveals some pertinent information. In essence, the following obtains:

1. The cusp of Carabelli was cuspoid 36.34 per cent in the "square type" casts in comparison with 21.18 per cent in the "tapering type" casts and 27.27 per cent in the "ovoid type" casts.

(a) The cuspoid type of cusp of Carabelli was minimally developed in only 4.97 per cent of the "square type" casts in comparison with 25.58 per cent in the "tapering type" and 28.57 per cent in the "ovoid type."

(b) The cuspoid type of cusp of Carabelli was moderately developed in 52.80 per cent of the "square type" casts in comparison with 41.86 per cent in the "tapering type" and 57.14 per cent in the "ovoid type."

(c) The cuspoid type of cusp of Carabelli was maximally developed in 42.23 per cent of the "square type" casts in comparison with 32.56 per cent in the "tapering type" and 14.29 per cent in the "ovoid type."

2. The cusp of Carabelli was lobular 54.85 per cent in the "square type" casts in comparison with 56.65 per cent in the "tapering type" casts and 54.54 per cent in the "ovoid type" casts.

(a) The lobular type of cusp of Carabelli was minimally developed in only 30.04 per cent of the "square type" casts in comparison with 79.14 per cent in the "tapering type" and 64.29 per cent in the "ovoid type."

(b) The lobular type of cusp of Carabelli was moderately developed in 65.43 per cent of the "square type" casts in comparison with only 20.87 per cent in the "tapering type" and 30.95 per cent in the "ovoid type."

(c) The lobular type of cusp of Carabelli was maximally developed in 4.53 per cent of the "square type" casts in comparison with only 0.87 per cent in the "tapering type" and 4.76 per cent in the "ovoid type."

3. The cusp of Carabelli was ridged in only 5.19 per cent in the "square type" casts in comparison with 12.81 per cent in the "tapering type" casts and 11.69 per cent in the "ovoid type" casts.

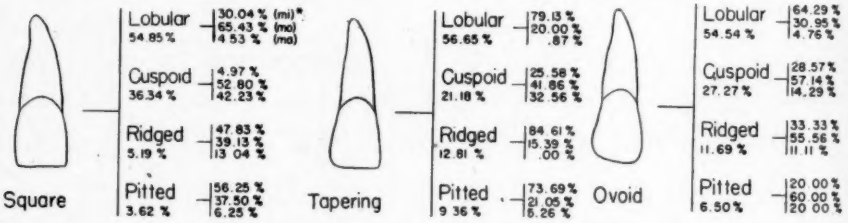

Fig. 3.—Frequency of occurrence of type of cusp of Carabelli with typal form of central incisor. The percentages as to the degree of development are indicated as mi, minimum; mo, moderate, and ma, maximum. These designations apply in identical sequence to all groups.

(a) The ridged type of cusp of Carabelli was minimally developed in 47.83 per cent of the "square type" casts in comparison with 84.61 per cent in the "tapering type" and only 33.33 per cent in the "ovoid type."

(b) The ridged type of cusp of Carabelli was moderately developed in 39.13 per cent of the "square type" casts in comparison with 15.39 per cent in the "tapering type" and 55.56 per cent in the "ovoid type."

(c) The ridged type of cusp of Carabelli was maximally developed in 13.04 per cent of the "square type" casts in comparison with absolutely none occur-

ring in the "tapering type" and 11.11 per cent in the "ovoid type."

4. The "cusp" of Carabelli was pitted in only 3.62 per cent in the "square type" casts in comparison with 9.36 per cent in the "tappering type" casts and 6.49 per cent in the "ovoid type" casts.

(a) The pitted type of "cusp" of Carabelli was minimally developed in 56.25 per cent of the "square type" casts in comparison with 73.69 per cent in the "tapering type" and only 20 per cent in the "ovoid type."

(b) The pitted type of "cusp" of Carabelli was moderately developed in 37.50 per cent of the "square type" casts in comparison with 21.05 per cent in the "tapering type" and 60 per cent in the "ovoid type."

(c) The pitted type of "cusp" of Carabelli was maximally developed in 6.25 per cent of the "square type" casts in comparison with 5.26 per cent in the "tapering type" and 20 per cent in the "ovoid type."

INCIDENTAL OBSERVATIONS

1. The original number of casts observed which presented the minimum requirements, with the exception of a classificatory central incisor, was 276.

2. Of the 1,000 selected casts, 747 had both first molars present.

3. In the 747 casts having both first molars, the cusp of Carabelli was found to be bilateral in all but seventeen instances. When absent on one molar, it was only minimally expressed on the other molar.

4. In the 747 casts having both first molars, the cusp of Carabelli was found to be asymmetrical in sixty instances. The difference never varied more than a single gradation.

5. The types of cusps of Carabelli may be combined. The ridged-pitted and lobular-pitted are the most frequent of these combinations.

6. If a single pit or ridge represents the pitted or ridged type, it is always the mesial component that is expressed.

7. A cusp, hitherto undescribed, was found well expressed in twenty-two instances, in the same position as the cusp of Carabelli, but on the maxillary second molar, and five times on the third molar.

8. The cusp on the second molar was present only when the cusp of Carabelli occurred on the first molar and was always the same in type. All types were found in the twenty-two instances, and were bilateral and symmetrical. A few were maximally expressed.

9. The cusps on the third molars were small, but definitely expressed. These were never present unless the fifth cusp appeared on the second molar.

DISCUSSION

Although, embryologically, the first permanent molar has its origin in the dental lamina of the deciduous teeth, the comparative simultaneity of calcification of the maxillary first molars and central incisors may cause these teeth to have exerted upon them similar effects arising from systemic influences.

The most incipient evidence of calcification of the first molar is regarded as present approximately at birth (more specifically, after nine months *in utero),* calcification of the central incisor following by only from three to four months.[7] Of even greater importance is the fact that the cusp of Carabelli probably begins to calcify at relatively the same time as the incisal edge of the central incisor.

The assumption of typal forms, by the central incisors especially, and the expression or repression of the cusp of Carabelli are occasionally a function of systemic impact upon the morphogenic period immediately preceding calcification. Nevertheless, the sovereign influence of heredity as to size and typal form is invariably seen to pervade all the teeth of a single complement.

This point of view concurs with that of Schour and Massler,[8] who assert that tooth development has within the cells, at the time of initiation, the entire growth potential of the tooth. Hence, teeth may develop at exotic sites, such as in the hypophysis and uterus, if, as these investigators maintain, "odontogenic epithelium and initiating and differentiating substances (morphogenetic hormones) are present." The explants of tooth germs of Glasstone[9] further confirm this and together with the investigations of Nuckolls[10] have proved the enamel epithelium to be the controlling factor in the size and form of the developing tooth.

Sarnat and Schour[11] have shown that the maxillary central incisors and first molars are affected with chronologic enamel aplasia, especially in the early infancy period. Sarnat *et al.*[12] have shown further the effects of congenital syphilis upon these teeth, stating that "permanent teeth which are active in morphodifferentiation may show a disturbed dentino-enamel junction with a characteristic distortion of the crown (Hutchinson incisor, moon molar)."

This evidence attests to the fact that the two teeth under consideration may be systemically influenced as to size and form by extragenetic conditions. I believe that these influences are of secondary importance, as related to this investigation, as all aberrant forms were eliminated from this study.

The fact that the cusp of Carabelli occurred 72.3 per cent of the time suggests that its appearance is a function of the law of segregation. "Undoubtedly, in all cases," says Colin,[13] "dominance is bound up in some way with the physiology of development of the organism. . . . From the evidence at hand, it is clear that every system of the body, and perhaps every organ and structure, is subject to the influence of known genes."

The numerical appearance of the cusp of Carabelli influences one to regard it as a mendelian dominant. However, the number of types found and the intensity of their expression may be a manifestation of complex genetic factors. In fact, although this number would be only slightly reduced, the inclusion of the pitted type of "cusp" of Carabelli may be erroneous as it is "more than absent" because it presents an indented surface, probably owing to invagination of the enamel epithelium.

However, the numerous mathematical possibilities of combinations of form and size of the cusp of Carabelli lead me to believe that the genetic pattern is not a simple one and that greater consistency of cusp type or size, or both, will be found within groups of less ethnic diversity.

CONCLUSIONS

1. A common morphotropic factor was found to be strongly, and quite objectively, operative between the maxillary central incisors and first molars.

2. A denture presenting a square type of central incisor exhibited a cusp of Carabelli on the first molar 92.29 per cent of the time.

3. A denture presenting a tapering type of central incisor may exhibit a cusp of Carabelli on the first molar only 50.49 per cent of the time.

4. In four types of cusps of Carabelli observed, the lobular occurred 55.33 per cent of the time, the cuspoid 31.12 per cent, the ridged 8.02 per cent and the pitted only 5.53 per cent.

5. The cusp of Carabelli was usually larger, irrespective of type, when concomitant with a square type of central incisor.

6. There was no consistency between a particular type of central incisor and the type of cusp of Carabelli.

7. Contrary to the observations of other investigators, the cusp of Carabelli occurred, in one of its four types, 72.30 per cent of the time.

8. This cusp was not confined to the

first molars only, but was found well developed on the second molar in twenty-two instances. However, it only occurred on the second molars when it was present on the first molars and was always the same in type. It is, therefore, not a unique feature of the first molar.

9. Combinations of any of the types of the cusps of Carabelli occasionally occurred. It was not infrequent that the pitted and ridged types were represented by only a single pit or ridge. When the latter occurred, it was always the mesial component that was expressed.

10. The cusp was found to be unilaterally expressed in about 2 per cent of the 747 casts presenting both first molars. The cusp that was present was never more than minimally expressed.

11. The cusps of a single cast were found to be asymmetrical (different in size) about 7 per cent of the time. The difference in size never exceeded a single gradation.

12. The genetic, and possibly ethnic, implications of the cusp of Carabelli point to a different approach, which may yield further information on this subject.

BIBLIOGRAPHY

1. DIAMOND, MOSES: Dental Anatomy. New York: Macmillan Company, 1929, p. 78.

2. WHEELER, R. C.: Textbook of Dental Anatomy and Physiology. Philadelphia: W. B. Saunders Company, 1940, p. 219.

3. CLAPP, G. W.: Life and Work of James Leon Williams. New York: Dental Digest Publishing Co., 1925, p. 178.

4. BERRY, F. H.: Institute of Pedagogics, December 1903. *Dentists' Mag.*, April 1906, p. 405.

5. WILLIAMS, J. L.: New Classification of Natural and Artificial Teeth. New York: Dentists' Supply Company.

6. HOUSE, M. M., and LOOP, L. L.: Form and Color Harmony in the Dental Art. Published and copyrighted by M. M. House, 1939.

7. SCHOUR, ISAAC, and MASSLER, MAURY: Development of Human Dentition (Chart). Chicago: American Dental Association.

8. *Idem:* Studies in Tooth Development: Growth Pattern of Human Teeth. J.A.D.A., 27:1778, November 1940; 27:1918, December 1940.

9. GLASSTONE, SHIRLEY: Development of Tooth Germs in Vitro. *Brit. D. J.*, 63:357, September 1937.

10. NUKOLLS, J.: Primary Centers of Lobular Development and Calcification in Tooth. *J. D. Res.*, 20:284, June 1941.

11. SARNAT, B. G., and SCHOUR, ISAAC: Enamel Hypoplasia (Chronologic Enamel Aplasia) in Relation to Systemic Disease. J.A.D.A., 28:1989, December 1941; 29:67, January 1942.

12. SARNAT, B. G., *et al.*: Deciduous and Permanent Teeth in Congenital Syphilis. *J. D. Res.*, 20:285, June 1941.

13. COLIN, E.: Elements of Genetics. Philadelphia: Blakiston Co., 1941, pp. 15 and 117.

Army Dental School.

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THE PRESENT STATUS OF PENICILLIN

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THE word "penicillin" brings much hope to the sick. Through the activities of the press, penicillin has become almost a household word—a much misunderstood word. Sulfanilamide, when first discovered, was regarded as a miracle drug, being credited with extensive therapeutic possibilities, many of which were based on conjectural reasoning rather than careful laboratory and clinical investigation. Penicillin occupies a similar position. It has been suggested for conditions in which it is of no value. It has, in fact, been regarded by some almost as a panacea. Its use has been suggested in crude form, grown by "kitchen sink" methods. Penicillin is an extremely useful addition to the medical armamentarium, but it has definite limitations. Newer knowledge of its actions and uses is rapidly accumulating because of feverish research by many different groups, and it is now possible to bring some semblance of order out of the chaos that has existed in theories as to the therapeutic value of the antibiotic penicillin.

HISTORICAL BACKGROUND

Since 1940, about 250 communications relating to studies on penicillin have appeared in scientific literature, the majority within the last year. The number of editorials in medical and other scientific journals and in the lay press relating to this class of agents probably will never be known, but the interest that has been created is as great as that following the discovery of the therapeutic value of the sulfonamides. The discovery is of special interest to those investigators who have known for many years that when molds and bacteria are grown together, molds inhibit the growth of bacteria. That the practical clinical possibilities of this phenomenon should remain unrecognized over so long a period is amazing.

Penicillin was discovered by an Englishman, Alexander Fleming, in 1929. Dr. Fleming was studying *Staphylococcus aureus* when he noticed that an exposed culture plate contained transparent and even disappearing staphylococcus colonies. Examination revealed the probable cause to be a discharge or secretion from a contaminating mold colony. Immediately he made further cultures and extracts and found his suspicions to be correct. During the next few years, occasional reports of bacteriologic examinations of this phenomenon appeared in the literature, but it was not until 1940 that Howard Walter Florey and his associates presented a clinical evaluation of penicillin while searching for agents for the treatment of infected war wounds. Such wounds are most commonly contaminated with staphylococcal organisms. Fleming identified the mold as a penicillium and coined the name penicillin for the active principle, but an American (Charles Tom, of the U. S. Department of Agriculture) identified the original strain, at Fleming's request. Because of the unstable nature of penicillin, attempts were made to obtain stable pure preparations. The first salt (sodium) was made in 1942 by Ian M. Heilbron and co-workers. Calcium, sodium and ammonium salts are now practical.

Penicillin provides interesting specula-

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tion, regarding not only its therapeutic possibilities, but also the degree of international cooperation that can be developed among scientists. The original discovery was made in England by English workers, and its therapeutic possibilities were discovered by English workers, but it was cataloged by an American investigator at the request of the English discoverer. The drug is being produced in increasing quantities in the United States, with the collaboration of English and Canadian workers, largely as a result of a visit to this country by the man who first applied penicillin clinically. In 1941, Florey visited the United States through the arrangement of the Rockefeller Foundation. After conferences with members of the National Research Council and the U. S. Department of Agriculture, Florey proceeded to the Northern Regional Laboratory of the Department of Agriculture, Peoria, Ill., where studies were initiated by R. D. Coghill and A. J. Moyer on cultural characteristics and methods of purification. Conferences were also held with several commercial laboratories and, in the latter part of 1941, a few drug houses began research studies preliminary to production. While difficulties of manufacture are numerous and perplexing, there are at present more than twenty firms interested in penicillin production. By July, twenty-one American and two Canadian firms will be approaching capacity manufacture.

The first clinical report on the use of penicillin in the United States was made by M. H. Dawson and associates in 1941. When more supplies became available in 1942, the Committee on Chemotherapeutic and Other Agents of the National Research Council, under the chairmanship of Chester S. Keefer, was invited to organize and supervise clinical investigations in selected hospitals, the records to be coordinated by Dr. Keefer and his committee. The cost of these studies is met by contract with the Office of Scientific Research and Development.

COOPERATION AND PRODUCTION

Penicillin has become so important that drug manufacturers under contract with the government may collaborate in its production without fear of conflict with the antitrust laws. Such freedom of cooperation followed a letter from the chairman of the War Production Board to the Attorney General's office. Many manufacturers and research centers are jointly interested in greater production, and cooperation between manufacturers and the other groups probably exists at a previously unknown peak. There is even a Penicillin Producers Industrial Advisory Committee. The Office of Production Research and Development, at the request of the War Production Board, is undertaking extensive study on the various penicillin production problems. Much work is being done in bacteriologic research laboratories and the results will be assembled by OPRD and reported to the industry. The Northern Regional Laboratory of the U. S. Dept. of Agriculture, the Office of Scientific Research and Development, U. S. Food and Drug ministration, U. S. Pharmacopeia Revision Committee and many other groups are offering material assistance to a better understanding of the possibilities of penicillin. The War Production Board has issued high priorities for equipment needed by penicillin manufacturers. Many plants are aided by grants from Defense Plant Cooperation. Universities are being provided with special funds for further study. For example, one midwestern university recently received from a drug manufacturer $25,000 a year for three years, to be devoted to the study of the composition and possible synthesis of penicillin.

Production in the United States during January was about 40 per cent higher than during December 1943, and about 6,000 per cent higher than during June 1943. An estimate of total American requirements ranges from 40 to 600 billion units. At the moment, even the minimum requirements are not being met.

During 1943 more than 21 billion units of penicillin were produced, enough for 21,000 cases if each case received 1,000,000 units. Unfortunately, penicillin cannot be made synthetically. Its structure is known to be complex, but synthetic manufacture appears to be something far in the future. Nevertheless, production has increased and, with increased output, the cost has dropped. At the start of the program, the cost to the government was $20 per hundred thousand units. Now it is $4.75 per hundred thousand units, and this may decrease further. The cost of production according to one estimate is $50,000 for 1000 gm. The manufacture of penicillin is not a very profitable procedure.

The production of penicillin is not a "bath-tub" or "kitchen-sink" proposition. The penicillin-producing mold is not necessarily the mold seen on bread, cheese, fresh fruits, etc., as commonly believed, and only a few strains of *Penicillium notatum* have been found to be worthwhile penicillin producers. There are many factors in a satisfactory output of penicillin and a non-toxic finished preparation. The product varies with temperature, humidity, bacterial contamination, period of growth, culture media and many other factors. It has been suggested that "crude" preparations of penicillin can be produced in the small laboratory and at home, but preparation of such "bath-tub" penicillin will result in as many headaches as that from the bath-tub gin of prohibition days. Home-grown penicillin may be contaminated by organisms that will cause infections worse than the one being treated. Further, the amount of penicillin present may be too small to be effective clinically and, if present in inadequate amounts, may cause the infecting organisms to become penicillin resistant.

At present, there are four methods for the manufacture of penicillin. These are the surface culture method, in which the mold is grown on the surface of a culture medium, usually in bottles or flasks; the submerged culture method, in which the mold grows in the culture medium in large containers; the so-called dry method, in which the mold is grown on a culture of bran, and the so-called trickle method. Frequently, reference is made to the shallow and deep-tray methods and to shallow and submerged methods of growing penicillin. These procedures simply involve the use of bottles or large tanks. The submerged culture method has certain practical advantages, especially from an economic viewpoint, but the main disadvantage is the necessity for rigid asepsis. It is difficult to keep sterile the fluid in these large containers, which may have a capacity of hundreds, even thousands, of gallons. Nevertheless, the use of large tanks instead of bottles may permit an increase of 200 per cent of penicillin production, and this method is being more extensively used because of the economic factor.

Penicillin is excreted by the mold into the culture medium and is extracted from the culture medium and not the mold. This separated penicillin is very unstable even in the culture medium. The separation is accompanied by a repeated extraction with various solvents under conditions which must be accurately controlled with respect to temperature, pH, etc. The final substance, which is solid, must be controlled equally carefully; otherwise it may absorb moisture. The sodium salt is most commonly used in this country, but is deliquescent and unstable in the presence of moisture. The calcium salt is superior in stability and perhaps will in time replace the sodium salt; or perhaps even other salts will be used.

The rate of capacity of the average firm is perhaps 5 to 10 billion units per month, but, at this time, firms are not running to capacity. A few firms can exceed these figures. It has been stated that there may be allocation for direct

civilian distribution by June 1944, but too much hope should not be raised. Perhaps, later in the year, this goal will be approached. However, it does seem apparent that more penicillin will be available, certainly for all cases in need of penicillin and not amenable to other forms of treatment. It requires from one to two weeks or more to produce penicillin, but, with speeded up manufacture, this time may be cut by several days. It has been estimated that about 10 gm. of penicillin can be produced from 160 quarts of mold culture. One plant designed to handle 60,000 bottles a week is said to be capable of producing sufficient material for about 3 billion units, but, with adequate experience, may be able to step up this production to about 15 to 20 billion units per month, if it resorts to the use of sufficient tanks to permit handling 14,000 gallons daily.

Briefly, a method of culture is as follows: The mold is grown in 2 or 3 gallon bottles and transferred to 20 gallon tanks, then to the larger seed tanks and finally to the large (several hundred to several thousand gallon) tanks. The growth period is several days. Then the culture liquid is filtered and collected, the penicillin absorbed on charcoal, diluted from this with water or acetone or amyl acetate and purified by a series of transfers between organic solvents and water. Other plants may incubate a culture of the spores for from four to six days, at the end of which the spores are used to inoculate many more bottles, and these in turn to inoculate the liquid mediums, which subsequently become penicillin broth and are incubated for from seven to fourteen days. The spores germinate and form white fluffy patches on the surface of the medium. Soon, they exude a yellow pigment and, in time, more green spores appear so that the surface assumes a greenish yellow appearance. A characteristic feature of the growth is the development of convolutions. The product which is finally marketed contains from 5 to 20 per cent or more of penicillin, the rest of the material representing impurities.

The early extracts that were used clinically contained sometimes as little as 20,000 units per gram. Those in common use now assay from 100,000 to 200,000 units per gram, and extracts have been obtained in small quantities with a potency of more than 2,000,000 units per gram.

After the war, some states may attempt to produce penicillin in laboratories of state health departments. However, the practicality of such a project remains to be proved. It is interesting that not only pharmaceutic houses, but also distillers are engaged in penicillin production. This might be expected, as distillers have gained much experience in the handling of molds.

Since penicillin is assuming such an important rôle in therapeutics, and since there is a comparative scarcity, other countries are interested in its manufacture; for example, England, Canada and Mexico. Even China could make penicillin provided there was available equipment for growth, extraction and purification. By way of comparison, China cannot make sulfonamides because she has no coal tar industry.

The need of penicillin per case may vary from thousands to millions of units. Perhaps an average case need can be estimated as one-half million units more or less. At the time of writing, more than 3,000 civilian patients in the United States have received treatment with penicillin.

STANDARDIZATION

The Committee on Scope of the U. S. Pharmacopeia has recently considered the inclusion of penicillin in the U. S. Pharmacopeia. Attempts are being made to provide satisfactory standards, an action which, of course, will be very important, especially when penicillin becomes available for civilian use. Ten-

tative standards have been provided, but these change with the accumulation of experience. It is expected that a penicillin reference standard will be adopted, a crystalline sodium salt having a potency equivalent to 1,650 Oxford units per milligram.

Before penicillin can be shipped in interstate commerce, a new drug application under the Federal Food, Drug and Cosmetic Act must become effective. Samples of each lot of penicillin are tested in the laboratories of the Food and Drug Administration to determine whether they comply with the existing, tentative standards. According to these standards, penicillin is defined as a metabolic product derived from a growth of *Penicillium notatum*. Any method of culturing and processing is acceptable, provided the finished product meets the prescribed minimum requirements. The sodium salt of penicillin is an acceptable derivative, but others may be developed in time. The pH of the final liquid concentrate is about 6.5. No preservatives can be contained in the finished, dry material, which must be sterile. All marketed material is in the dried form, at present as a sodium salt. The liquid concentrate is dried from a frozen state in vacuum. Sizes of containers are 5 cc. for the 10,000 unit size, 10 cc. for 25,000 units and from 20 to 25 cc. for 100,000 units. Sometimes, the final container assay shows a variation greater than the permitted ± 15 per cent, in which case the labels must so state. In case of a decrease of more than 30 per cent, the lot must be destroyed. Final containers may be flame sealed or fitted with a diaphragm stopper.

Potency assays of material in the final container are made with *Staphylococcus aureus*, FDA strain 209. The methods of potency assays for preliminary testing are the cup and dilution methods. With the cup method, the Oxford unit is defined as the least amount of penicillin which, when dissolved in 1 cc. of water, will inhibit the growth of *Staphylococcus aureus* in a zone having a diameter of from 2 to 2.5 cm., or equal to the zone of clearing produced by one unit of the standard preparation. One Oxford unit, when measured by the dilution method, is the amount of penicillin which, when diluted to 1:50 in nutrient broth, completely inhibits growth of the standard test dose of *Staphylococcus aureus*. The potency assay on the final product is a cylinder plate or cup method described by the FDA.

Safety tests are made by injecting at least five mice with 100,000 Oxford units per kilogram of mouse weight. No test animals must die within forty-eight hours. Pyrogen tests are made on rabbits. A moisture determination is also made. A dating period of three months is permitted, this period being reckoned from the date of sealing of the final container. The finished product is stored below 10° C. The label of the finished container must indicate the name of the product, number of Oxford units present ± 15 per cent, lot number, expiration date, name and address of manufacturer or distributor and statement about storing below 10° C.

The Food and Drug Administration uses the cylinder plate method of assay, occasionally supplemented by a serial dilution technic. The standard now used for comparison with the unknown is obtained from the Northern Regional Laboratory at Peoria, Ill. A reference standard of penicillin calcium is obtainable by all manufacturers from the Food and Drug Administration. Special culture media and reagents are used for assay, as well as the growth of the organism during its production. The assay depends on the zone of inhibition. The diameter of each circle is measured to the nearest 0.25 mm., by a Quebec colony counter. The diameter of the zone of inhibition is interpreted in terms of Oxford units by use of a reference chart prepared from data compiled at

the Northern Regional Research Laboratory. This chart makes it possible to read the units of penicillin corrected for the daily variation of the standard; that is, if the average zone of inhibition of the standard on any one day differs from the grand average, a correction is made for this deviation.

ACTIONS AND USES

The first case treated by Florey was that of an English policeman suffering with a severe abscess of the face and osteomyelitis. The sulfonamides had no effect and penicillin was administered. Improvement was immediate and lasting, until the small stock of penicillin was depleted. Florey, knowing that much of the penicillin was excreted in the urine, recovered what he could from the patient's urine and administered this until the supply was gone. The effects were sufficiently striking to encourage further clinical trials on other patients.

The first one to use penicillin in the front line of the present war was an English medical officer, who has been awarded the D.S.O. for doing so under heavy enemy fire on the Sicilian beaches.

Penicillin is being tested in Army, Navy and civilian hospitals and elsewhere in the treatment of serious types of infection, especially those which do not respond to the sulfonamide therapy. Because of the limited amount of penicillin, a scheme has been devised whereby it may be used most advantageously for research and clinical application. This scheme simply permits the release of so much material to the various interested bodies, the armed forces having priority. The distribution and manufacture of all penicillin are controlled by the War Production Board, but actual distribution rests with certain responsible agencies. All material provided for clinical use is actually used for research. The civilian supply is released by a committee headed by Chester S. Keefer, of Boston. A telegram, telephone call or letter from the attending physician, giving details of the case, is necessary to allocation of penicillin for civilian use. In November 1943, the Army is said to have received 56 per cent of the total supply, the Navy 18 per cent, the U. S. Public Health Service (for treatment of coast guard and merchant marine personnel) about 2 per cent, the Office of Production Research and Development (for civilians) about 15 per cent, the remainder going to the drug companies for their own research. No agency receives so much as it needs.

Penicillin is no cure-all, even though it has been described as a miracle drug in more than one published article. Unfortunately, dramatized headlines and wishful thinking sometimes create erroneous beliefs in the uninformed. The actions and uses of penicillin have been reported in a number of periodicals. Excellent reviews are those by Chester S. Keefer and his associates of the Committee on Chemotherapeutic and Other Agents, Division of Medical Sciences, National Research Council (*J.A.M.A.*, 122:1217, August 28, 1943), and Champ Lyons (*J.A.M.A.*, 123: 1007, December 18, 1943), and several articles that appeared in the March 4, 1944, issue of the *Journal of the American Medical Association*.

Dr. Keefer presented a report on the treatment of 500 cases of various infections. Solutions of penicillin were given intravenously, intramuscularly and topically, the methods including local injection into the pleura, pericardium and joints and into the subarachnoid space. Before use, penicillin is dissolved in sterile distilled water or other fluid and then used immediately. Penicillin was injected intravenously, either in constant injections or in repeated injections at two, three or four hour intervals. For intravenous use, concentrations of 1,000 units or less of Oxford units per cubic centimeter were used at each injection. When a constant injection was used, the concentration was varied, de-

pending on the total dosage during a given period. The rate of injection in some cases varied from 5,000 to 10,000 units an hour for twenty-four hours, to much smaller or much larger amounts. It was regulated so that the rate of delivery was between 75 and 100 units per cubic centimeter an hour, the penicillin being dissolved in a saline solution or 5 per cent dextrose solution. With intramuscular injection, in order to keep the volume as low as possible and avoid local discomfort, the usual practice was to employ a concentration of 5,000 units per cubic centimeter. The total amount of penicillin administered varied greatly from one case to another. Optimal dosage remains to be determined in many of the conditions, but is influenced by titration of the penicillin in the blood serum, body fluids and exudates and, above all, by clinical response.

The intravenous injection of penicillin results in a high initial concentration in blood plasma, which is followed by a sharp fall, occurring within minutes. Almost immediately, a high concentration of penicillin appears in the urine, the average excretion after intravenous injection being 50 per cent or more of the administered dose. It is absorbed more slowly when given intramuscularly, and even more slowly after subcutaneous injection. Absorption from body cavities, which is delayed, as might be expected, is reflected in the slow excretion of penicillin by the kidneys. Oral and rectal doses are poorly absorbed, but absorption from the duodenum is rapid. It seems very likely that inactivation of penicillin in the stomach is due to the hydrochloric acid present, and in the rectum to *E. coli* organisms. Penicillin is not excreted in the spinal fluid, saliva or tears, although a small amount may appear in the bile. For an effect in the central nervous system, the drug must be injected intrathecally or intracisternally. Penicillin seems to be slightly irritating to the normal meninges as an injection may be followed by headache and vomiting. In the presence of meningitis, absorption of penicillin from the intrathecal space is greater than in normal subjects.

Since some strains of organisms become resistant to penicillin, the dosage must be adequate. This development of resistance is extremely interesting and merits further investigation. Organisms that become resistant to penicillin remain susceptible to the sulfonamides. Unlike the resistance observed in some sulfonamide-resistant strains, an increased resistance of organisms to penicillin is associated with a proportional loss of virulence.

Penicillin has been applied topically in powdered form, although the sodium salt is irritating to wound surfaces and should not be used. It is better to prepare isotonic solutions of sodium chloride with a concentration of 250 units of penicillin per centimeter. This concentration may be increased twofold if necessary. Patients under 40 years of age respond best to penicillin therapy. Penicillin has been used with success in *Staphylococcus aureus* infections with and without bacteremia, streptococcal infections other than bacterial endocarditis, pneumococcic infections, gonococcic infections, meningococcic infections and, more recently, in syphilis and gas gangrene. The staphylococcic infections have included acute and chronic osteomyelitis, cellulitis, carbuncles, suppurative arthritis, empyema and burns. Of course, it has been of great value in those cases of infection that are resistant to the sulfonamides. Other investigations being conducted at the moment concern the use of penicillin in the treatment of typhus and certain infections occurring in the tropics.

There has been much comment on the value of penicillin in subacute bacterial endocarditis. Recently, an article in the *Journal of the American Medical Association* reported favorably on its use in several cases of bacterial endocarditis.

However, before the Sixth Annual Congress on Industrial Health (February 1944), Dr. Keefer stated that he and the other members of his group had been following fifty-five cases of bacterial endocarditis. At the end of one year, only four patients were still living. This does not seem especially hopeful.

In the review of the use of penicillin in the treatment of surgical injections by Major Lyons are very interesting comments on the value of a constant intravenous method of treatment for immediate life-endangering infections, local application of the powdered sodium salt and solution, use of penicillin by injection through tubes and incorporation into ointments and as a wet dressing, the lack of effect of penicillin therapy on the metabolic balance of nitrogen calcium and phosphorus, the importance of providing proper surgical interference (removal of foreign bodies, pus, etc.) and regarding penicillin merely as a valuable therapeutic adjunct, the value of plasma or other blood substitute to maintain the nitrogen balance before and after surgical procedures and the conditions that have responded to penicillin therapy.

In view of these excellent reviews and other available information, it seems unnecessary to explain in detail the indications for penicillin. It should be emphasized, however, that penicillin is extremely valuable in the presence of sulfonamide-resistant organisms, is most effective against gram-positive bacteria and has no effect on gram-negative organisms with the exception of meningococci and gonococci and no effect on gram-negative bacilli. The therapeutic effect is usually very rapid and dramatic, although dosage must be high and maintained until all signs of clinical infection have disappeared. Its value in chronic infections, such as chronic osteomyelitis, remains more in doubt except for evidence that penicillin is not a substitute for surgical measures in such conditions. It may be combined with surgery.

Further, it is sometimes possible to obtain bacteriologic successes, but clinical failures, with penicillin, indicating that sterilization alone is not always sufficient. Nevertheless, a good example of the effectiveness of penicillin is seen in the treatment of staphylococcal bacteremia. This condition usually has a fatality rate of about 85 to 90 per cent. The use of penicillin has reduced it to 30 per cent.

Penicillin acts by interfering with the normal metabolic processes of the bacteria. An interesting observation reported almost two years ago showed bacteria undergoing normal growth in the presence of pencillin, but failing to undergo fission.

TOXICITY AND REACTIONS

Penicillin possesses very low toxicity. There have been no severe reactions and the incidence has decreased with purer material. Perhaps the observed reactions have been due to the impurities. Included in the reactions were chills and fever, thrombophlebitis at the site of injection, headache, flushing of face, urticaria, transient azotemia, tenderness at the site of injection, tingling in the testes and pain in muscles. The reactions are not so common as in earlier days before pyrogens and other undesirable things were removed. Individuals apparently have not become permanently sensitized to penicillin, being able to take it for second and third courses of treatment.

PENICILLIN AND THE SULFONAMIDES

It is difficult at the moment to compare penicillin and other antibiotics with the sulfonamides, information still being greatly lacking because the discovery is recent and the supply curtailed. From what knowledge has been gained, penicillin seems to be a useful adjunct to the medical armamentarium, but not a com-

plete substitute for the sulfonamides. An amazing difference between these compounds is the dilution that inhibits the growth of susceptible bacteria. For example, the use of sulfathiazole in a concentration of one to several thousand will inhibit the growth of staphylococci, whereas penicillin in a dilution of one to several million acts to inhibit growth.

Penicillin therapy frequently results in apparent cures in fewer days than would be required by a sulfonamide. It may have an immediate response in a briefer period than is required by sulfanilamide and derivatives. Economically, this is of great importance to the working man and his employer. Further, penicillin may be very effective where a sulfonamide has been of no value. Penicillin has virtually no toxicity, whereas the use of any sulfonamide involves some risk. Sulfonamides are inactivated in the presence of pus, but penicillin is less affected, although it is advisable to remove excessive pus before application, as otherwise penicillin would float on top of this material instead of coming in contact with the invading bacterial organisms. One unfortunate aspect of penicillin is its quick excretion, which necessitates repeated or continuous injection. Also, it is not active by mouth, whereas sulfonamides are.

In comparing the actions of these two classes of drugs, it should be remembered that penicillin may affect organisms that have never been affected by a sulfonamide; for example, syphilis. Finally, the sulfonamides are available in almost unlimited quantity. Naturally, they should be used if the infection is one that will respond.

OTHER ANTIBIOTICS

When the importance of penicillin was realized, studies proceeded immediately on the characteristics and therapeutic possibilities of other mold and bacterial extracts. Much impetus to such study was provided by the reports from the laboratories of Rene J. Dubos, who found that certain soil bacteria could be developed into death-dealing agents; that is, lethal for other bacteria. From this man's careful work has come the agent known as tyrothrycin, actually a mixture of gramicidin and tyrocidin obtained from cultures of *Bacillus brevis*. It is too toxic for injection and has no effect when given by mouth, but is of decided clinical value when applied locally in the treatment of infections caused by gram-positive cocci (streptococci, staphylococci, pneumococci, etc.) and bacilli (diphtheria). It has comparatively little action against gram-negative cocci and bacilli, with the exception of meningococci and gonococci. It does not penetrate the tissues and its use is of no value in deep-seated infections unless in association with surgical interference.

Other names that are becoming familiar are patulin (from *Penicillium patulum)* and clavacin (from *Aspergillus clavatus),* which have recently been shown to be identical. Patulin was suggested for the treatment of the common cold, but in view of later work, such claims must be regarded with some skepticism for the present time. It may have some value on topical application in certain infections, but is too toxic for injection. Even though stable, the true clinical status of the compound remains to be determined.

Streptothricin, fumagacin, actinomycetin, citrinin, pyocyanin and gliotoxin are just a few of a large number of biologic extracts that have been studied. Some are predominantly bactericidal, some are bacteriolytic, some are bacteriostatic and others are antagonistic to fungi. The extent to which these agents are studied is remarkable. Fleming had suggested earlier that penicillin might be a useful laboratory agent to weed out unwanted bacteria in cultures. Others have carried studies even to the extent of determining the ability of antibiotics to inhibit the

luminescence produced by certain forms of life. An excellent review of the nature and mode of action of antibiotic substances has been provided by Selman A. Waksman (*J. Bacteriol.*, 45 :64, January 1943. Other extracts will follow as research progresses.

PENICILLIN IN DENTISTRY

Penicillin and other antibiotics are receiving the attention of some investigators with a view to determining the therapeutic possibilities in ophthalmology and otolaryngology. A few studies have been carried out, but much work remains to be done. In dentistry, the possibilities of these compounds must remain more or less within the realm of conjectural reasoning until more adequate supplies are available and investigations are underway. Undoubtedly, penicillin would be an extremely valuable aid in the presence of a developing staphylococcal or streptococcal infection, especially if the patient does not respond to sulfonamide therapy. The possible use of penicillin, tyrothrycin, etc., as wet packs in the presence of local infection offers a field for interesting speculation. The thought of treating sinus infections and conditions of similar nature is also provocative.

At this time, the status of antibiotics in the dental field remains undetermined. It seems certain, however, that this group of compounds will ultimately be another powerful weapon to the dentists' ever-searching hands, hands whose work has gained for their owners the respect of the scientific world and all civilized communities.

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DENTISTRY IN THE REHABILITATION OF THE FEDERAL OFFENDER

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A SERIOUS problem facing federal, state and local governments is the control of crime. In dealing with those who have already broken the law, their function is to shield the community from these criminals as much as possible. How successfully this protection is rendered will depend largely on how we are guided in the formulation of penal policies.

Not many years ago, society believed that protection from crime lay in a rigorous and severe treatment of its offenders. Harsh corporal punishment and strong discipline were believed to be deterrents from further lawlessness. However, the constantly increasing number of "repeaters" and the ever-mounting threat to society from the hopeless and embittered men released from penal institutions proved strong testimony to the fallacy of that philosophy.

With progress in the fields of medicine, psychology and sociology has come a better understanding of human behavior, and with this a new concept of the criminal has evolved. Today, we believe that crime is a social disease which, like other diseases, is subject to cure when properly diagnosed and treated. It is believed that after an exhaustive study of the prisoner's background, a "diagnosis" or "classification" of him can be

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made, and then a "program" or course of individual treatment can be prescribed for his eventual "cure" or "rehabilitation." This is the idea upon which the present federal penal system is based; sounding the keynote for all incarceratory procedures in this country. What better protection can be offered the community than to have its offenders return as normal, healthy citizens eager to participate in good, useful living?

The aim of the prison is to try to reform these men and eventually release them physically, mentally and morally better than when they first entered. While the purely medical and psychiatric phases of this work have received much attention and publicity, the dental aspects of rehabilitation have been neglected. It is the purpose of this paper to present the rôle of the dentist in this program. The major contribution of dentistry toward the welfare and morale of federal prisoners, and eventually toward society as a whole, adds another chapter in the history of the profession as a health service to humanity. It is a chapter of which we may well be proud.

With the development of the new penal policy, it was found that medical administration and practice in prisons could be greatly improved and that more modern and more extensive equipment was required. Therefore, by act of Congress in May 1930, the United States Public Health Service was authorized to assume responsibility for all medical work in the federal prison system. The well-organized Dental Corps of the Public Health Service was augmented to minister to all oral and dental needs of inmates of federal prisons. Although those members of the corps who are detailed for duty in prison hospitals operate under the jurisdiction of the Department of Justice, the regulations and high professional standards governing the United States Public Health Service are the guiding principles of all dental officers connected with the supervision and furnishing of dental care in the federal penal and correctional institutions.

There are twenty-seven institutions of various types in the federal penal system. Those housing a large number of inmates for comparatively long terms (penitentiaries, reformatories, correctional institutions and the National Training School for Boys) have completely modern dental clinics and laboratory facilities that are equal to those found at military stations or in civilian practice. They are staffed by one or two full-time dental officers who hold commissions in the service. The small institutions, such as camps and jails, with a small inmate population for relatively short terms, have incomplete clinics with no laboratory facilities, and support only a part-time dental officer.

Prison dentistry aims to correct all oral conditions detrimental to the health of inmates. This means not only care for physical health, but also the mental and rehabilitative measures that have a significant place in the treatment program. However, the restoration of physical health is imperative and, owing to the limited dental personnel caring for a large group of men, a practical consideration of utmost importance is the equitable distribution of service to all beneficiaries concerned. The primary purpose is to provide the essential treatment to the greatest number of patients rather than to perform special operations or to construct extraordinary appliances for a few.

The services concerned with physical health are mandatory obligations covered by "routine dental treatment" and "limited prosthetic treatment." The former includes all work necessary to restore the mouth to a clean, healthy condition—prophylaxes, extractions and removal of foci of infection, amalgam and synthetic porcelain fillings, root-canal treatments and fillings and treatments for the alleviation of pain and acute oral pathologic conditions such as Vincent's infection, pyorrhea alveolaris, mercurial and

bismuth stomatitis, gingivitis, etc. When the problem of practical mastication of food arises because of an insufficient number of occluding teeth, the full denture or the partial denture is provided, in order to avoid development of digestive conditions. The full denture usually meets most of the requirements in conditions seen at these institutions. It is the appliance of first choice because, with a limited budget, it can be made more quickly, at less expense and in greater quantity. However, in some cases, the partial denture is required and, except for esthetic considerations, to be discussed later, it is furnished for utilitarian rather than esthetic purposes.

All service is absolutely free of charge. Inmates are not even permitted to pay for any special work, such as inlays, crowns or fixed bridgework. Under present circumstances of penal dentistry, any service involving the use of precious metals is not undertaken, nor is it justified. Should a fractured angle on an incisor tooth confront the dentist, temporary restoration can be made with cement or amalgam to protect the tooth until the inmate is discharged and can have an inlay made. Stainless steel and chrome alloy metals in the form of clasp wire, clasp blanks and lingual and palatal bars are, however, available for use in partial denture work. Dentures are processed in vulcanite or the acrylic resins that have recently been introduced.

Not until the prerequisites of all routine dental service are met can we give consideration to elective or esthetic oral rehabilitation. While the latter is less urgent than the physical well-being of the inmate, it does concern his "mental health" and social rehabilitation. These are desirable and necessary obligations.

The most prominent feature of this type of service is the partial denture for the replacement of missing anterior teeth, an unsightly condition which by all means should be rectified. This physical deformity is apt to result in a strong feeling of inferiority. If the handicap is uncorrected, a sensitiveness develops, usually attended by abnormal facial expressions and emotional reactions. Eventually, it may be reflected in the mental health, warping the personality and relationship with others. The dentist must help the orally disabled from developing such unhealthy and abnormal personality traits. For what is the value of rehabilitation if, owing to such dental disabilities, the inmate is unable, through fear and inferiority, to face a prospective employer and ask for a job? What is the purpose of a program that teaches the illiterate to read and write, which sponsors vocational training for the unskilled, which attempts to instil personal habits of hygiene and responsibility, all to aid a man to go forth with renewed confidence in himself, when his oral condition disqualifies him in the eyes of his fellow-man and an employer?

An inmate committed to a federal penal institution goes through a quarantine period, during which he is given a complete physical examination and his entire social, economic, educational, religious and psychologic background is investigated. He receives a G.I. toothbrush and dentifrice, but many prefer to buy their own at the prison commissary in the attempt to maintain some individuality. At this time, he also receives his primary dental examination, which comprises a part of his physical report. Except for full mouth roentgenograms, examination is as thorough as it can be made with a fine explorer and mouth mirror under an operating light. Roentgenograms are, however, taken when necessary during the course of treatment as a diagnostic aid and as an operative aid in removing impacted teeth or eliminating foci of infection. The following are recorded on the inmate's dental chart: caries, missing teeth, condition of mucous membranes, type of occlusion, arch form, presence of fixed or removable appliances and any other significant find-

ings. The patients are then placed on call and given appointments by the dental officer. Inmates may, however, present themselves at any time for emergency treatment, which, of course, takes precedence over any appointments.

The inmate patient shows a great deal of interest in his dental work, as proved by the frequent mention made of it in his correspondence to relatives and friends, and the many voluntary requests for treatment. He is usually very desirous of getting his mouth "fixed up," and takes advantage of all service offered to him. While it is his prerogative to refuse treatment, there are only a small percentage of men who, through fear and ignorance, and in spite of attempts at education and advice by the dentist, fail to avail themselves of this service. The restoration of a badly decayed tooth, the removal of an aching infected root or the "slick" fresh feeling of a prophylaxis are concrete services that the inmate realizes and appreciates much more than others that are too intangible or abstract for his comprehension.

In serving a large group of men of this type, with a slow but steady turnover, the following procedure of "appointment control" has been found most effective. The first meeting is devoted to a thorough prophylaxis. All necessary extractions or other surgical operations are performed at ensuing sittings, and then the required operative work is done. At this point, early restoration of the molar and cuspid teeth is considered in preference to the care of other anterior and bicuspid teeth. Teeth in occlusion are filled before those that do not occlude. Finally, if time permits, all fillings are carefully polished, and, if the conditions warrant it, as described above, a partial denture completes the rehabilitation of the mouth. A complete checkup and prophylaxis is given at least once a year. The number and frequency of appointments naturally depends on such conditions as the amount of work that the patient requires, the urgency of treatment, the length of the inmate's sentence and the size of the inmate population. The patient whose mouth is in very poor condition, and who is serving a relatively short term, will be given more frequent attention than the one who requires little work and has ample time for treatment. It is obvious too that the larger the inmate population, the less the time available to be spent on the individual.

The vocational training programs sponsored by federal prison industries are an important phase of rehabilitation. These attempt not only to teach a man skill in a productive occupation, to provide economic security after release, but also foster in him a feeling of responsibility for holding a job and of doing that job well. A valuable contribution for the achievement of this purpose is made by the dental service, which copes with any oral condition that might arise and threaten to keep a man from his work.

Today, while the country is engaged in terrible and unprecedented war, every source of effort must be found. With their resources, the federal penal system is also actively participating in the tremendous war task of producing goods needed by the armed forces.

The interdependence of oral health and war manpower, whether on the battlefield or on the production line, is appreciated today more than ever before. The originally high incidence of rejections for armed service because of dental defects stirred military and civil officialdom as well as the dental profession. The soldier who cannot masticate the army ration because of insufficient teeth or the one who is plagued by oral decay and infection is a casualty before he steps into uniform. The same holds true for the "soldiers of production," the men and women in the munitions plants who must turn out the weapons that provide our men with the firepower for victory.

Oral sepsis is the underlying cause of an astonishingly high percentage of the

cases of non-occupational illnesses, which are responsible for loss of many work-hours in industry. This serious condition can affect the efforts of the penal industries as well. Whether it be the worker who has taken time off to attend to a throbbing toothache or the one who must be away from his job because he catches cold and gets sick easily owing to a low state of general health attributable to mouth conditions, or whether it be the employe who cannot do his best because he is mentally retarded and physically debilitated by a chronic neuralgia or arthritis of dental origin, a competent dental service plays an extremely important part in the diagnosis and elimination of such causes of absenteeism. In this respect, the prison dentist serves as well as his professional colleague in industry, making Dentistry's contribution to a greater, more productive war economy an integral part of the rehabilitation program.

Many of the federal offenders who are released find their way into the production lines or the armed forces of our nation. To the dentist, it is heartening to know that they are orally fit to assume their duties wherever they go without burdening further the already overtaxed resources of the military and the home-front. The inmate himself is encouraged, knowing that his mouth is in good condition and that his pursuits will not be interrupted by some oral defect for some time to come. But whether now, while we are at war, or in years to come, long after peace and security are reestablished, the criminal will return to society with the best possible basis of physical and mental health that the federal prisons of the United States are capable of giving him. Within his rehabilitation lies the essence of social protection. It is a worthy thing that Dentistry has resolved to do its vital share in this human service. Dentistry will ever serve the individual and the community by promoting the health and appearance of the federal offender, to give him a normal outlook on life and help him to forget the "ex-convict." That is the inmate's earnest desire; and he will depend greatly on his renewed faith, his improved health and outlook when seeking a new, useful and decent place in the competitive world that awaits him.

BIBLIOGRAPHY

1. United States Prison Service Study Course. March 1935. Bureau of Prisons, Department of Justice, Washington, D. C.

2. Gearing Federal Prisons to War Effort, 1942. Bureau of Prisons, Department of Justice, Washington, D. C.

3. STUTSMAN, J. O.: Curing the Criminal. New York: Macmillan Co., 1926.

4. TANNENBAUM, FRANK: Crime and the Community. New York: Ginn and Co., 1938.

5. SUTHERLAND, E. H.: Principles of Criminology. New York: J. B. Lippincott, 1939.

6. MORRIS, ALBERT: Criminology. New York: Longmans, Green & Co., 1938.

7. THOMAS, E. H.: Mouth Infection in Industrial Workers: A Serious Menace to General Health; Resultant Loss to War Production. J.A.D.A., 30:1249, August 1, 1943.

THE RÔLE OF PROPRIETARY MEDICINE IN DENTAL THERAPEUTICS

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THE intelligent use of drugs in dental therapeutics has contributed much to progress in this field in recent years. Dental schools throughout the United States are largely responsible for this contribution through the addition of increasingly comprehensive courses in biochemistry, materia medica and pharmacology to a curriculum that already requires predental basic courses in inorganic and organic chemistry. The close relationship of these various courses becomes apparent to the student as he approaches that point in his professional training where he makes practical application, in the study of dental therapeutics, of what he has learned in previous courses. By this time, the student has become familiar with the term "proprietary," although he may know little of its significance owing to his limited experience.

The object of this paper is to present a brief discussion of proprietary medicine, and to determine what rôle proprietary medicine should play in dental therapeutics.

Dorland[1] defines a proprietary medicine as "any chemical, drug or similar preparation used in the treatment of diseases, if such article is protected against free competition as to name, product, composition or process of manufacture by secrecy, patent, copyright or other means." The latter part of this definition makes it obvious that proprietary preparations conforming to this definition cannot be considered in the same light as official preparations contained in the United States Pharmacopeia[2] and the National Formulary,[3] or as those accepted proprietaries contained in Accepted Dental Remedies[4] or New and Nonofficial Remedies.[5]

Professional men are well acquainted with the term "proprietary," particularly when it is used in connection with the healing arts. This fact, however, does not protect the individual practitioner, his patients or the dental profession as a whole from the far-reaching harmful effects resulting from the promiscuous office use of questionable proprietary preparations by the dentist. This applies also to proprietary preparations prescribed for the patient's use.

The widespread use of proprietary drugs in the field of dental therapeutics has many factors. One factor, perhaps the most important of all, was supplied by the profession itself. For many years after dentistry attained recognition as a profession, the use of proprietary drugs in the treatment of carious lesions of the teeth and of other diseases affecting associated structures was limited by that group of conscientious practitioners who, then as now, bound by the ethics of their profession, and guided by sound judgment, refused to use or prescribe any preparation of doubtful value to their patients. Another and perhaps larger group included those who would "try anything once," without knowledge of the ultimate effect on their patients. This group provided fertile ground for those who took advantage of the ignorance of the times to sow the seeds of commercial

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exploitation in a branch of the healing art.

The manufacturers and distributors of these pseudoscientific preparations realized better than the profession itself how little some professional men of a few decades ago knew about the treatment of oral disease by drugs. In this respect, both the dentist and his alma mater were at fault: the dentist, because of his failure to obtain a comprehensive knowledge of materia medica and its allied studies on his own initiative after graduation; his alma mater, for failure to provide its graduates with that cornerstone of basic science, coupled with the stimulus to postgraduate study, upon which all sound professional education is built. Lacking this scientific background and the perspective that it affords, the dentist was an easy prey for those who exploited the profession for their own selfish ends.

The zealous efforts of these nostrum peddlers had and are having results probably beyond their fondest hopes. As in the past, their methods of approach to the dental profession have been devious and varied. There has always been a marked difference between the methods of the transient salesman who carries his office in his sample case and those of the established manufacturer whose trade practices are often dictated by the executives of the company's advertising and sales promotion departments.

A discussion of the methods of the transient salesman would necessarily be long and tedious, as they are almost as numerous as the individuals under discussion. Many of them are misguided people with little or no scientific background, who attempt to sell a homemade concoction prepared according to a "secret" formula, often in the belief that they have something of magical therapeutic value. The fallacy of this approach lies in the fact that the salesman fails to realize that the progressive professional man recognizes no "secrets" in the treatment of patients through the use of drugs, and is, therefore, not receptive to any sales talk to promote a panacea.

As yet, science has not learned of the existence of any drug or any combination of drugs that possesses magical cure-all properties. The obvious truth of this statement is not yet apparent to many of the gullible members of the profession. This group continues to use these proprietary preparations as a substitute for preparations of recognized merit or as a stop-gap in their professional ignorance. They have placed themselves and the profession in jeopardy repeatedly by relegating their patients to the status of experimental guinea-pigs. Any dentist who questions this last statement would do well to recall how many times he has used or prescribed a proprietary preparation when he knew little or nothing of its chemical composition or probable therapeutic effect.

The methods of the established manufacturer are worthy of note. By his clever use of the "professional approach," he has made commercial exploitation of the professional man a fine art. Many of these manufacturers of questionable proprietary products employ dentists, physicians, pharmacists or members of other professions that require a background of scientific training to act as their representatives. This practice serves to open many doors that would otherwise remain closed to these firms, and has proved very successful in breaking down the sales resistance of the prospective customer. The success of this practice can be measured by the fact that they have, in many instances, persuaded unsuspecting dentists to play an important part in their advertising and sales promotion campaigns. Perhaps the best way to illustrate this condition is to cite a few examples.

The following method has proved quite successful. The dentist is given a

liberal supply of printed prescription blanks. The inscription contains the name of the proprietary preparation, and the prescription is complete except for the dentist's signature. Various means are used to persuade him to use these blanks. He may be promised a commission for each prescription blank given to a patient, and subsequently filled at the corner drug store. The representative of the firm supplying the blanks collects them from the pharmacist at periodic intervals, and pays the dentist a commission based on the number of signed blanks. In this connection, it may be said that the retail pharmacist usually cooperates, primarily for the purpose of retaining the good will of those members of the allied professions in his locality.

Another method in general use involves the free distribution of the proprietary preparation by the dentist, eliminating the pharmacist altogether. In this case, the dentist finds that he can obtain liberal mounts of the preparation from the manufacturer or distributor merely for the asking. These are supplied with descriptive labels, which sometimes devote considerable space to the therapeutic usefulness of the preparation, along with extravagant claims, testimonials and other information that would tend to promote the sale of the product. The gullible practitioner who "prescribes" or, more correctly, distributes these samples for his patients' use could not be advertising and promoting the sale of the preparation more effectively if he were in the employ of the manufacturer or distributor. To the dentist who accepts them, these samples represent something for nothing and provide medication in a convenient form to be dispensed to that class of patients who want to "take something" for their ailments. By his use of the printed prescription blanks and samples and, in some cases, by his personal recommendation of the preparation to his patients, the dentist gives it his professional approval.

The foregoing methods are a few of many that have been used successfully by the manufacturers and distributors to attain their objective, which is, obviously, to secure public acceptance of their product. They have long been aware of the fact that professional recommendation of a product by a dentist or physician is regarded as authoritative by the average patient. An important point for the professional man to remember is that his patients may not make the expected use of the recommendation, but will remember it and pass it on to others by word of mouth at, for example, the bridge table, where the fate of so many professional careers is decided.

What rôle should proprietary medicine play in dental therapeutics? The dental profession, through the American Dental Association, provided a logical answer to this complex question by establishing the Council on Dental Therapeutics, in 1930. Since that time, the Council has been extremely active in investigative work in the field of therapeutics and other related sciences. As a result, the Council has been able to demonstrate to the profession the therapeutic worthlessness of many proprietary preparations. It is hardly necessary to state that the work of the Council has been of inestimable value to the profession. By publishing its findings in THE JOURNAL, the Council has performed an educational service. The subsequent printing of these findings in Accepted Dental Remedies provides the student and practitioner alike with a digest of ready useful information, and it is my firm conviction that a copy of the latest edition of Accepted Dental Remedies should be in the possession of every dentist and dental student.

To the public, the work of the Council may not be so well known as it is to the profession, but such visible evidence

as, for example, the Seal of the Council on a commercial dental preparation is sufficient to inform the intelligent layman who buys such a preparation that he or she is making a sound investment. Further, the purchaser is convinced that the dental profession, through the Council, is actively interested in the quality, purity and therapeutic usefulness of commercial preparations for dental use by the public.

Notwithstanding the valuable work that the Council has done in outlining and limiting the rôle of proprietary medicine in dental therapeutics, it is often necessary for the individual dentist to determine for himself to what extent proprietary preparations should be used in his daily practice. It may not be possible for him to make this determination in general terms, as the nature of the medicament to be used varies with each patient under treatment. The use of drugs in the treatment of some oral abnormalities of a minor nature is not indicated because the removal of the causative factor, with the resultant restoration of normal blood and lymph circulation to the affected parts, will usually restore these parts to a state of health.

In many instances, the use of drugs in the treatment of these cases retards rather than accelerates healing; therefore, the utmost care is essential in that phase of treatment planning involving the use of drugs. In those cases of oral disease wherein the use of drugs is definitely indicated, official drugs should be used by the dentist wherever possible and prescribed by him for home use by the patient. Aside from the fact that it is simply good practice for the dentist to prescribe official drugs, a considerable financial saving is effected, which benefits both dentist and patient, in that the cost of dental care is lowered without impairment of the quality of the treatment rendered.

An advantage in prescribing official drugs and mixtures of them lies in the fact that the dentist is able to vary the quantity and strength of the mixture to suit the individual requirements of the patient. It is hardly necessary to make a comparison between the cost of a proprietary preparation and the cost of the same preparation under a U.S.P. or N.F. label. Many examples well known to the profession can be cited, and the price differential in many cases is surprising. Occasionally, it may be necessary for the dentist to use or prescribe a proprietary preparation. The accepted proprietaries found in Accepted Dental Remedies or New and Nonofficial Remedies are numerous, and the dentist should have no difficulty in selecting one suitable for the case under treatment. In no instance should a dentist make use of or prescribe a preparation the composition or therapeutic effect of which is unknown to him. The use of such a preparation is a dangerous and unethical procedure and cannot be condoned under any circumstances.

The prescribing of drugs or mixtures of drugs by the dentist for home use by patients has been mentioned repeatedly in previous paragraphs. This can be done in several ways, not all of which are acceptable as good practice. The use of printed prescription blanks has been discussed and needs no further consideration. Verbal prescribing by the dentist is widely used and has the advantage of being a time saver for the practitioner who feels that he cannot spare the few minutes consumed in writing a prescription. The disadvantage of this method is that the patient may forget or confuse the name of the preparation, particularly if he or she has not heard it before, or the directions for use, or both. The third method, and the most valuable of all, is use of the written prescription. In most cases, the psychologic effect created on the patient by this

method cannot be overestimated. The intelligent patient is gratified to learn that a particular aid or remedy is being prescribed for his individual benefit. He or she is further impressed by the fact that the dentist is not limited to the use of instruments alone, but is able to utilize his knowledge of materia medica and therapeutics as well, in the treatment of oral disease.

The dentist who neglects to prescribe necessary drugs for his patient should bear in mind that the patient may thereby conclude that his oral affliction is trivial and will "clear up" in a few days. The problem of forestalling this too often erroneous conclusion rests squarely on the dentist, as oral diseases are anything but trivial, particularly when necessary treatment is neglected. This method of prescribing is of great benefit to the profession as a whole, for it cannot be denied that what we do individually in daily practice reflects on the profession collectively. In view of the foregoing, it can be stated that the extra time and effort involved in writing a prescription pays worthwhile dividends, which should not be overlooked.

It is my firm belief that many of the unethical practices of the commercial nostrum peddlers will disappear when prescription writing by members of the profession becomes more general. While this form of prescribing will require more effort on the part of the dentist, he will have the satisfaction of knowing that he is no longer a distributor of samples for a group not particularly interested in his welfare. He will also have the added satisfaction of knowing that he has taken an important step in improving the quality of the health service that he is rendering to the public.

NOTE: The opinions or assertions contained herein are those of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large. (Article 113, United States Navy Regulations, 1920.)

BIBLIOGRAPHY

1. DORLAND, W. A. N.: American Illustrated Medical Dictionary. Ed. 19. Philadelphia: W. B. Saunders Co., 1943.

2. Pharmacopeia of United States of America. Board of Trustees, United States Pharmacopoeial Convention, Inc., Washington, D. C. Ed. 12, 1942.

3. National Formulary. Committee on National Formulary, American Pharmaceutical Association, Washington, D. C., Ed. 7, 1942.

4. Accepted Dental Remedies. Ed. 10. Council on Dental Therapeutics of the American Dental Association Chicago, 1944.

5. New and Nonofficial Remedies. Council on Pharmacy and Chemistry of the American Medical Association, Chicago, 1943.

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THE COUNCIL ON DENTAL THERAPEUTICS

As the Council on Dental Therapeutics nears the completion of its fifteenth year of service to the dental profession, it is appropriate that more than passing notice be given to the progress which the work of this standing committee has made possible. In this issue of THE JOURNAL, a group photograph of the members of the Council appears as the frontispiece, and in the first article the objectives, methods and membership of the Council are discussed.

The Council was organized in 1930 to provide a broad and authoritative source of information with regard to therapeutic, prophylactic and diagnostic products. The work of the A.D.A. Bureau of Chemistry, which was established three years earlier, was tied in with that of the Council and the two agencies function as a unit.

During the years of the early development of the Bureau of Chemistry and the Council, many of the most objectionable nostrums reformed or were taken off the market. Those who were practicing dentistry during the late twenties and early thirties will remember some of the flagrant nostrums which the Council exposed during that period. Secret formulas were the rule rather than the exception. The Council was

largely influential in the removal of the cloak of mystery which surrounded drugs and dentifrices. A casual examination of the label of any accepted local anesthetic now on the market will reveal the change.

Today, the Council provides for the profession a list of approximately 600 accepted commercial products, which are described in its book, Accepted Dental Remedies. All the drugs which are needed in the practice of dentistry are described in this publication. Every member of the profession should have a copy of a recent edition and should refer to it frequently. For easy reference, a list of the accepted commercial products is given in the Council on Dental Therapeutics section in this issue of THE JOURNAL. This list does not take the place of A.D.R., however, since the book contains many formulas, including those for commercial products, and much other information.

Although the number of unacceptable products on the market has been reduced as a result of the Council's pioneering activities, inferior, inadequately tried and potentially dangerous products are still proposed for use and prescription by the dentist. The Council is able to advise some of the firms who might market such products and, as a result, only a relatively few reach the market. The Council informs the profession with regard to such products by means of articles in its section of THE JOURNAL.

In October of 1943, the scope of the Council was broadened to include devices and physical therapy apparatus. This action brought such items as pulp testers, interdental stimulators, ultraviolet disinfecting lamps, diathermy and ionization equipment and toothbrushes within the purview of the Council. The Council has already published a decision with regard to ultraviolet disinfecting lamps. In its recent annual report, the Council stated that such lamps as presently promoted for use in dental practice were unacceptable. In view of the cost of such devices, this Council action alone should result in a substantial saving to those dentists who are guided by it.

All members of the dental profession can help the Council to help the dentist and his patients by using and prescribing only accepted products. If a representative of a commercial firm suggests that a dentist use or prescribe a product which comes within the scope of the Council, the first question to the salesman should be, "Is this product accepted by the Council on Dental Therapeutics?" If the product is not accepted, the commercial representative has no right to waste the dentist's time in a discussion of its supposed merits.

Unity of support from the profession is essential to the complete success of any A.D.A. project. All of the Association members would like to have patients realize that the only cure for their dental ailments, in the light of current scientific knowledge, is the dentist's skill in instrumentation and in the selection and use of drugs. The Council is keenly aware that the skill and judgment of the individual dentist is the foundation of dental health. Its efforts in the field of advertising, particularly dentifrice advertising, are largely directed toward the elimination of statements which lead the reader to believe that drugs, dentifrices or devices have some magic property which in itself will prevent or cure disease. The restrictions which the Council places on advertising are such as to make it clear that the credit for the prevention and cure of dental disease belongs to the individual dentist.

Especially during this critical period, when all dentists are hard pressed to care for their patients, the dental office should not be an experimental laboratory for inadequately tested or potentially harmful preparations. The number of disappointing incidents in dental practice would have been much fewer during the past fifteen years if all the members of the profession had used nothing but Council-accepted drugs and had suggested that their patients use only accepted dentifrices. Let us use and prescribe only Council-accepted products.

BIBLIOGRAPHICAL

Medical Radiographic Technic.

Prepared by the Technical Service Department of General Electric X-Ray Corporation, under the editorial supervision of Glenn W. Files, director, and seventeen contributors. 365 pages, with 381 illustrations. Price $6. Springfield, Ill.: Charles C. Thomas, 1943.

DENTISTS and x-ray technicians who are called upon to x-ray all parts of the body will find this reference book on medical roentgenographic technic of great value. The book is written by technicians for technicians and is "an accumulation of material based upon facts now available which have proved to be an aid in producing a 'better end result' and the reasons why." The fundamental electrical concepts of x-rays are clearly presented, and the equipment necessary for producing good roentgenograms is described in detail. Twenty-nine pages of illustrations are devoted to osteology; which should aid the technician in locating the regions the radiologist may wish to study. In the last section of the book (165 pages), the positioning of the patient, the direction of the central ray, the size of the film and the exposure time are considered. A representative film of the area described is included on each page. Roentgenographic interpretation is not considered in this book. A chapter of fourteen pages is concerned with dental roentgenographic technic, using a large x-ray machine. The technic

described is not applicable to a dental office equipped with a regular dental x-ray machine.

The chapters on factors in the quality of the roentgenograms are carefully prepared and should prove helpful. The book can be recommended to all who are required to take x-ray films of the body.

M. K. H.

Oral Pathology. A Histological, Roentgenological and Clinical Study of the Diseases of the Teeth, Jaws and Mouth. By KURT H. THOMA, D.M.D., Professor of Oral Surgery and Brackett Professor of Oral Pathology, Harvard University; Oral Surgeon and Chief of Dental Service, Massachusetts General Hospital; Oral Surgeon to Brooks Hospital; Dental Surgeon to Dental Department and Consultant in Oral Surgery to Tumor Department, Boston Dispensary and Joseph H. Pratt Diagnostic Clinic; Consulting Oral Surgeon, New England Baptist Hospital; Consulting Oral Surgeon, Beth Israel Hospital. Second Edition, 1328 pages with 1388 illustrations including 128 in color. Price $15. St. Louis: The C. V. Mosby Company, 1944.

THE excellent comprehensive reference book of oral pathology by Dr. Thoma which was published in 1941 proved to be so popular that the supply has already been exhausted. Rather than reprint the original, Dr. Thoma chose to publish a second edition, which has just been released.

Dr. Thoma discusses in detail the hereditary, endocrine and nutritional influences on the teeth and jaws, and has gathered together many valuable data on these subjects. He next considers developmental anomalies of the teeth and head, functional changes of the teeth, traumatic injuries of the teeth, odontitis, dental caries, pulpitis, periodontal diseases, extension of odontogenic infections, diseases of the jaws, tumors of the jaws and oral mucosa and diseases of the oral mucosa, lips, tongue and salivary and mucous glands. Dr. Thoma quotes freely from other authors to present the most authoritative material available. Good references are appended to each chapter.

The first 1,002 pages are almost identical in the two editions, but in the last 300 pages some additions and changes have been made. A few of the rarer diseases have been added. Some new color plates have been added and a few discarded. In all, the new edition has twenty-two more pages, nine fewer color plates and a total of eighteen more illustrations than the first edition. Because these changes are rather minor ones, one cannot recommend the purchase of the second edition by some one who already owns the first.

However, the book remains without equal as an encyclopedia of oral pathology. As a reference book for libraries and for use by students, general practitioners and specialists in oral surgery or periodontia, it will prove very helpful. In many college courses in oral pathology, this book has been used as a required textbook.

M. K. H.

The Impacted Lower Third Molar. By WILLIAM E. DURBECK, A.B., D.D.S., Consultant, Department of Oral Surgery, Robert B. Green Memorial Hospital; Oral Surgeon, Texas State Crippled Children's Bureau; Visiting Staff, Medical and Surgical Memorial Hospital; Teaching Faculty, School of Nursing, Medical and Surgical Memorial Hospital; Plastic Surgeon, Gonzales Warm Springs Foundation for Crippled Children; American Society of Oral Surgeons and Exodontists; Past President, Texas Society of Oral Surgeons and Exodontists. 181 pages, 115 illustrations. Price $5. Brooklyn: Dental Items of Interest Publishing Co., Inc., 1943.

IN this age of specialization, it is not surprising to find a volume dealing with one dental operation, the removal of impacted lower third molars. The management of the impacted mandibular molar is a matter of frequent concern to the general practitioner and much needed information is included in this book. However, it is doubtful that reading this or any other book will solve all the problems associated with this complex operation. The author discusses the problem of the impacted mandibular molar systematically, beginning with anatomic considerations and then outlining the technics for clinical examination, preoperative treatment, anesthesia, roentgenographic considerations, plan of procedure, technic of instrumentation and postoperative care. The author states that in "the

overwhelming majority of cases, the use of local anesthesia is mandatory in the removal of an impacted mandibular third molar" (page 65). The technic for injection is described and illustrated adequately, although not in great detail. The use of the Winter and Cryer elevators is described and the author recommends bone removal by automatic mallet, the osseous reamer or the rongeur. Postoperative care is briefly discussed. The author emphasizes that technical procedures must be varied in each case according to anatomic structures. The book is simply written, with no attempt to be ultrascientific. No bibliography is given, but the index is complete.

M. K. H.

Dental Practice Management. Including Ethics, Economics and Socio-Economics, and Jurisprudence as Applied to Successful Practice Management.

By WILLIAM H. O. MCGEHEE, D.D.S., M.D., late Professor of Dental Practice Management, Georgetown University; formerly Professor of Dental Pathology, Pharmacology and Therapeutics and Dean, Dental Department, Medical College of Virginia; Professor of Operative Dentistry and Superintendent, Ohio College of Dental Surgery; Professor of Operative Dentistry and Director of Clinic, Western Reserve University Dental School; Professor of Operative Dentistry and Secretary, New York University College of Dentistry, etc., and ALFRED S. WALKER, D.D.S., Professor Emeritus of Pulp Canal Therapy and Special Lecturer on Practice Management, New York University College of Dentistry; former Member of Board of Dental Examiners, State of New York; formerly Chairman, Judicial Council, American Dental Association; Member Dental Advisory Committee of President Roosevelt's Committee on Economic Security; Past President, New York State Dental Society; President, Section on Dentistry and Oral Surgery, Pan American Medical Association, etc. Chicago: Year Book Publishers, Inc.

LITERATURE on the technic of dental practice management is indeed scarce, yet every one agrees that the careful organization of a dental practice is essential to success and happiness in the practice of dentistry. This book has been written to serve as a text on the art of practice management and as a reference book for all dentists who realize they need information about the fundamentals of organization and management of a dental practice. The book is divided into three sections, which cover ethics as applied to dental practice, the business management of professional practice and jurisprudence. It is true that one cannot teach a system of practice management which would be applicable to all men in all locations. The authors realize this, presenting facts designed to help one to evaluate his own desires and decide on the type of practice for which he is fitted and the type that he wishes to build. The book contains much that will be helpful to the recent graduate in many of the serious and complex problems associated with dental practice management.

Supplement to the Dental Treatment of Maxillo-Facial Injuries.

By W. KELSEY FRY, L.D.S., Consulting Dental Surgeon to the Royal Air Force; P. Rae Shepherd, L.D.S., Dental Surgeon, East Grinstead Maxillo-Facial Unit; Alan C. McLeod, D.D.S., Dental Surgeon, East Grinstead Maxillo-Facial Unit, and Gilbert J. Parfitt, L.D.S., Dental Surgeon, East Grinstead Maxillo-Facial Unit. Cloth. 494 pages, illustrated. Price 21/net. Oxford: Blackwell Scientific Publications Limited, 1943.

IN 1942, the authors published a convenient monograph on the "Dental Treatment of Maxillo-Facial Injuries" which consisted of the principles of dental care in the management of these injuries that the authors had found effective. The present volume discusses in greater detail, and with actual case histories, the management of certain of these injuries. The two volumes should therefore be read together, since this final book is a supplement to the first number. The arrangement of the supplement follows closely that of the parent volume, starting with radiology, proceeding to pathology and surgery, fractures with teeth on both fragments, fractures of the condyle neck, the edentulous posterior fragment, fractures of the edentulous mandible, fractures of the middle third of the face, technic,

first aid, complications and loss of tissue. The illustrations have been arranged to face the page of text, thereby facilitating reading. These two books are of particular significance since they report in detail the treatment of actual cases of injuries received in warfare. The present book, therefore, has an authenticity which cannot be assumed by other volumes in the same field.

F. F. K.

Oral Diagnosis.

By KURT H. THOMA, D.M.D., Professor of Oral Surgery and Brackett Professor of Oral Pathology, Harvard University; Oral Surgeon and Chief of Dental Service, Massachusetts General Hospital; Oral Surgeon, Brooks Hospital; Dental Surgeon, Dental Department, Consultant in Oral Surgery, Tumor Department, Boston Dispensary and Joseph H. Pratt Diagnostic Hospital; Consulting Oral Surgeon, New England Baptist Hospital, and Consulting Oral Surgeon, Beth Israel Hospital. Second Edition, revised. 495 pages, 666 illustrations, sixty-three in color. Price $6.75. Philadelphia: W. B. Saunders Company, 1943.

THE first edition of Dr. Thoma's book "Oral Diagnosis and Treatment Planning" has proved to be a definite aid in teaching oral diagnosis to dental students, and has excited favorable comment from practicing dentists. However, many men felt the value of the book could have been increased by the inclusion of suggestions for treatment. So, in the second edition of his book, which has just been published, Dr. Thoma has added a section at the end of most chapters in which he presents the principles of treatment of the conditions described in that chapter. This innovation is not entirely successful, for obviously the discussion of treatment must be very brief; but, in general, the remarks about treatment are helpful and the reader will welcome them. More than 100 pages and 130 illustrations have been added to the new edition, and the text has been thoroughly revised. In organization, the book follows the same general pattern as that of the previous edition. The author first considers principles and methods of examination, and then discusses the diagnosis of dental and oral diseases, and comments briefly on their treatment.

As with all of Dr. Thoma's writing, this book is written in a clear logical manner, accurate in detail, and is well illustrated. It can be recommended as a textbook for undergraduate dental students and a reference book for dental graduates.

M. K. H.

Fundamentals of Occlusion.

By SAMUEL HEMLEY, D.D.S., F.A.C.D., Head of the Department of Orthodontics, New York University, College of Dentistry. Cloth. 377 pages, 286 illustrations. Price $6.50. Philadelphia: W. B. Saunders Co., 1944.

THE importance of the subject of occlusion in all phases of dentistry, and particularly in orthodontia, has led to the development of this book. This volume has been designed primarily as a text for undergraduate courses in orthodontics. The confusion arising from the different concepts of normal occlusion has emphasized to the author the necessity for a study of the fundamental biologic factors in its development. The author has made an attempt to clarify these basic fundamentals and to show their influences in the field of orthodontics. The biochemical and physical factors in bone growth are stressed. All these factors are analyzed in their relation to the study of occlusion. No one can deny the importance of the study and integration of these factors in dental problems. The conclusions and inferences of the author may be disagreed with in part, because of the incomplete state of knowledge existing at the present time. A few omissions and errors are noted. Figure 122 shows a cleft of the distal portion of the hard palate as well as the soft palate, disagreeing with the observations of the author in this particular case. The influence of the increase in size of the soft tissues, such as the tongue, or mandibular bone growth is not mentioned under acromegaly, and the author chooses to ignore the fascinating question of how mandibular growth is effected in this disease. All in all, the book is a valuable contribution to dental literature and should prove to be of interest to all those in dental practice.

F. F. K.

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COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

In order that every member of the American Dental Association may have readily available a complete list of the commercial products which are currently accepted by the Council on Dental Therapeutics, the following list is published. It is not intended as a substitute for the Council's book, Accepted Dental Remedies, which includes much more material, such as the formulas for these and many other preparations, a description of their properties, their actions and uses, dosages and other useful information.*

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*Chicago: American Dental Association, 304 pages. Price $1.

Acetone-Mallinckrodt[1]
Acetone-Merck[2]

ACIDS

Benzoic Acid-Mallinckrodt
Benzoic Acid-Merck
Boric Acid-Mallinckrodt
Boric Acid-Merck
Hydrochloric Acid-Mallinckrodt
Hydrochloric Acid-Merck
Diluted Hydrochloric Acid-Mallinckrodt
Nitric Acid-Mallinckrodt
Nitric Acid-Merck
Phenolsulfonic Acid-Moyer[3]
Phosphoric Acid-Mallinckrodt
Phosphoric Acid-Merck
Sulfuric Acid-Mallinckrodt
Sulfuric Acid-Merck
Sulfuric Acid, 50% Solution-Moyco
Tannic Acid-Mallinckrodt
Tannic Acid-Merck
Tannic Acid-Moyco
Trichoracetic Acid-Mallinckrodt
Trichloracetic Acid-Merck
Trichloracetic Acid, 90%, 10% Solution-Moyco

Algin[4]

ALUMINUM COMPOUNDS

Ammonium Alum-Mallinckrodt
Potassium Alum-Mallinckrodt
Aluminum Acetate-Basic-Mallinckrodt

AMMONIUM COMPOUNDS

Ammonium Acetate-Mallinckrodt
Ammonium Carbonate-Mallinckrodt
Ammonium Carbonate-Merck
Zephiran Chloride (Cook-Waite Labs.)
Zephiran Chloride Solution 1:250
Zephiran Chloride Solution 1:1000

ANESTHETICS

Anesthetics—General

Chloroform-Mallinckrodt
Chloroform-Merck
Ether-Mallinckrodt
Ether-Merck

Kelene (Ethyl Chloride)-Merck

Trichlorethylene-Lederle[5]

Vinethene-Merck

Anesthetics—Local

Benzyl Alcohol-Merck

Butyn Sulfate-Abbott[6]

Butyn Sulfate and Epinephrine Hypodermic Tablets-Abbott

Butyn Sulfate Tablets, 0.2 Gm.-Abbott

Dental Ointment Butyn 4% and Metaphen 1:1500-Abbott

Chlorobutanol-Merck (Hydrous)

Chlorobutanol-Merck (Anhydrous)

Cocaine Hydrochloride-Mallinckrodt

Cocaine Hydrochloride-Merck

Cocaine Hydrochloride-Tablets, P. D. & Co.[7]

Cocaine and Adrenalin Tablets-P. D. & Co.

Local Anesthetic Solutions Intended for Injection

Accepted local anesthetic solutions are examined periodically in the A.D.A. Bureau of Chemistry to determine whether they are accurately labeled and whether they are reasonably free from undissolved sediment. Samples are checked for sterility by consultants at the expense of the Council. Manufacturers of all accepted brands have agreed to test routinely every batch of every dosage form of their accepted products for sterility.

Solutions which contain more than 2 per cent procaine or more than 1 per cent Monocaine, or which contain such anesthetics as Pontocaine (brand name for tetracaine) in addition to the usual concentration of procaine, are considered by the Council to be potentially toxic to a dangerous degree and lacking convincing evidence of general desirability for routine use. Injection of as little as 0.01 gram of procaine, the least toxic of the agents mentioned, has been known to cause death by cardiovascular collapse in sensitive persons (Goodman, L., and Gilman, A.: The Pharmacological Basis of Therapeutics. New York: Macmillan Co., 1941.) For such reasons as these, ready-prepared dosage forms of greater concentration than the minimum compatible with successful anesthesia are not acceptable.

Read the following list and find out whether the anesthetic solution you are using is accepted.

Monocaine Hydrochloride

Monocaine HCl 1%, Epinephrine 1:75,000
Novocol Chemical Mfg. Co., Inc.

Novocain Solution 2%

Novocain Solution 2%, Cobefrin 1:10,000

Novocain 2.2%, Cobefrin 1:9000 with Sodium Bicarbonate Solution

Novocain 2%, Epinephrine 1:50,000

Novocain 2%, Epinephrine 1:25,000
Cook-Waite Laboratories, Inc. (Carpule Brand)

Novocain 20%, Suprarenin 1:9000 (This solution must be diluted)

Novocain 2%, Suprarenin 1:50,000
Novocain 2%, Suprarenin 1:25,000
Novocain 1%, Suprarenin 1:100,000
Novocain 1%, Suprarenin 1:50,000
Winthrop Chemical Co., Inc.

Procaine HCl
Abbott Laboratories
Mallinckrodt Chemical Works
Merck & Co., Inc.
Neo-Quest Chemical Co., Inc.
Novocol Chemical Mfg. Co., Inc.

Procaine HCl Solution 2%
Abbott Laboratories
Novocol Chemical Mfg. Co., Inc.

Procaine HCl Solution 2% (Isotonic)
Abbott Laboratories

Procaine HCl 2%, Epinephrine 1:75,000
Dental Products Co. (Oryl Brand)

Procaine HCl 2%, Epinephrine 1:70,000
Minimax Company

Procaine HCl 2%, Epinephrine 1:60,000
Abbott Laboratories
Anestex Laboratories

Procaine HCl 2%, Epinephrine 1:50,000
Abbott Laboratories
Anesthetic Laboratories (Guild Brand)
Bunny Dental Supply Co.
Dental Commodities Company
Dental Products Co. (Oryl Brand)
Entisol Laboratories
Exodontia Products Co.
Jefferson Laboratories
Kimball Dental Mfg. Co.
Minimax Company
Neo-Quest Chemical Co.
Novocol Chemical Mfg. Co., Inc.
Premier Dental Products Co.
Proco-Sol Chemical Co.
Reliance Dental Mfg. Co.
William H. Rorer, Inc.
L. Silverman
Standard Dental Products Co.
Star Dental Mfg. Co., Inc.

Procaine HCl 2%, Epinephrine 1:30,000
Abbott Laboratories
Anestex Laboratories
Novocol Chemical Mfg. Co., Inc.

Procaine HCl 2%, Epinephrine 1:25,000
Abbott Laboratories
Anesthetic Laboratories (Guild Brand)
Bunny Dental Supply Co.
Dental Commodities Co.
Dental Products Company (Oryl Brand)
Entisol Laboratories
Exodontia Products Co.
Jefferson Laboratories
Kimball Dental Mfg. Co.
Neo-Quest Chemical Co.
Premier Dental Products Co.
Proco-Sol Chemical Co.
Reliance Dental Mfg. Co.

William H. Rorer, Inc.
L. Silverman
Standard Dental Products Co.
Star Dental Mfg. Co., Inc.

Procaine HCl 2%, Epinephrine 1:20,000
Novocol Chemical Mfg. Co., Inc.

Procaine HCl 2%, Neo-Synephrine HCl 1:3500
Bunny Dental Supply Co.
Exodontia Products Co.

Procaine HCl 2%, Neo-Synephrine HCl 1:3333
J. F. Hartz Company

Procaine HCl 2%, Neo-Synephrine HCl 1:3000
Proco-Sol Chemical Company

Procaine HCl 2%, Neo-Synephrine HCl 1:2500
Anestex Laboratories
Jefferson Laboratories
Premier Dental Products Co.
Reliance Dental Mfg. Co.
William H. Rorer, Inc.
L. Silverman
Standard Dental Products Co.

Tablets

Monocaine HCl-Epinephrine Tablets
Novocol Chemical Mfg. Co., Inc.

Novocain 0.125 Gm., Suprarenin 0.00013 Gm. Hypodermic Tablets
Novocain 0.1 Gm., Suprarenin 0.00025 Gm. Hypodermic Tablets
Novocain 0.08 Gm., Suprarenin 0.00006 Gm. Hypodermic Tablets
Novocain 0.06 Gm., Suprarenin 0.00006 Gm. Hypodermic Tablets
Novocain 0.05 Gm., Suprarenin 0.000083 Gm. Hypodermic Tablets
Novocain 0.02 Gm., Suprarenin 0.00005 Gm. Hypodermic Tablets
Novocain 0.02 Gm., Suprarenin 0.00002 Gm. Hypodermic Tablets
Novocain 0.01 Gm., Suprarenin 0.0002 Gm. Pluglets
Winthrop Chemical Co., Inc.

Procaine HCl Tablets, 0.02, 0.05, 0.2 Gm.
Procaine HCl 0.02 Gm., Epinephrine 0.00002 Gm. Hypodermic Tablets
Procaine HCl 0.02 Gm., Epinephrine 0.00004 Gm. Hypodermic Tablets
Procaine HCl 0.02 Gm., Epinephrine 0.000016 Gm. Hypodermic Tablets
Abbott Laboratories

Procaine HCl (0.05 Gm.) Tablets
Procaine HCl (0.02 Gm.), Epinephrine (0.000045 Gm.) Tablets
Procaine HCl (0.02 Gm.), Epinephrine (0.00002 Gm.) Tablets
Procaine HCl (0.05 Gm.), Epinephrine (0.000083 Gm.) Tablets
Procaine HCl (0.02 Gm.), Epinephrine (0.000045 Gm.) Tablets
Procaine HCl (0.02 Gm.), Epinephrine (0.00002 Gm.) Tablets
Procaine HCl-Epinephrine Billets
Novocol Chemical Mfg. Co., Inc.

Tablets Tutocaine HCl 0.03 Gm. with Suprarenin 0.15 mg.

Tablets Tutocaine HCl 0.03 Gm. with Suprarenin 0.06 mg.
Tablets Tutocaine HCl 0.1 Gm.
Tablets Tutocaine HCl 0.05 Gm.
Winthrop Chemical Co., Inc.

In some instances, it may be that unaccepted products which are stated to contain the same amounts of active ingredients as those in this list may be marketed by firms that have some products accepted. In case of doubt, consult the latest edition of A.D.R. or write to the Secretary of the Council on Dental Therapeutics, 222 E. Superior St., Chicago 11, Ill.

Anesthetics—Local—Slightly Soluble

Anaesthesin (ethyl aminobenzoate)-Winthrop
Anesthesin (ethyl aminobenzoate)-Abbott
Benzocaine-Mallinckrodt
Benzocaine-Merck
Benzocaine-Benzyl Alcohol Solution-Hammer[8]
Benzocaine-Chlorobutanol Dressing Gauze-Austin[9]
Benzocaine-Chlorobutanol-Menthol Solution-Exodontia
Benzocaine Ointment with Oil of Cloves-Novocol
Benzocaine Solution with Oils of Cloves and Wintergreen-Novocol
Benzocaine-Chlorobutanol Solution-Bisbee[10]
Benzo-Chlorobutanol Dressing with Balsam of Peru-Bisbee
Ethyl Aminobenzoate Tablets-Bisbee
Butesin (butyl aminobenzoate)-Abbott
Orthoform-Winthrop

ATROPINE PREPARATIONS

Atropine Sulfate-Mallinckrodt
Atropine Sulfate-Merck

Balsam Peru-Merck

BARBITURATES

Barbital-Abbott, 5 gr. Tablets
Barbital-Mallinckrodt
Barbital-Merck
Barbital-Rorer, Compressed Tablets, 5 grains
Barbital-Squibb
Barbital-Squibb, Tablets, 5 grains
Veronal (barbital)-Winthrop
Veronal Tablets, 5 grains-Winthrop
Elixir of Veronal-Winthrop
Barbital Sodium-Abbott, 5 grain Tablets
Barbital Soluble-Mallinckrodt
Barbital Sodium-Merck
Veronal Sodium (soluble barbital)-Winthrop
Veronal Sodium Tablets, 5 grains-Winthrop
Ipral Calcium-Squibb

Ipral Calcium, ¾ gr. Tablets-Squibb

Ipral Calcium, 2 gr. Tablets-Squibb

Ipral Sodium-Squibb

Ipral Sodium, 4 gr. Tablets-Squibb

Neonal-Abbott

Neonal Tablets, 0.1 Gm.-Abbott

Ortal Sodium-Parke, Davis & Co.

Ortal Sodium 0.05, 0.2, 0.3 Gm. Capsules-Parke, Davis & Co.

Ortal Sodium with Phenacetin Kapseals-Parke, Davis & Co.

Phenobarbital-Abbott

Phenobarbital-Abbott, ¼, ½, 1½ gr. Tablets

Phenobarbital-Mallinckrodt

Phenobarbital-Merck

Phenobarbital-Rorer, Compressed Tablets ¼, ½, 1½ gr.

Phenobarbital-Squibb

Phenobarbital-Squibb, 0.016, 0.032, 0.097 Gm.-Tablets

Luminal (phenobarbital)-Winthrop

Luminal Tablets, ¼, ½, 1½ gr.-Winthrop

Elixir of Luminal-Winthrop

Elixir of Phenobarbital-Squibb

Luminal Sodium (phenobarbital sodium)-Winthrop

Luminal Sodium Tablets, ¼, ½, 1½ gr.-Winthrop

Phenobarbital Sodium-Abbott, 1½ gr. Tablets

Phenobarbital Sodium-Mallinckrodt

Phenobarbital Sodium-Merck

BROMINE DERIVATIVES

Brometone-Parke, Davis &Co.

Brometone Capsules-Parke, Davis & Co., 5 gr.

Bromural-Bilhuber-Knoll Corp.[11]

Bromural Tablets, 0.3 Gm.-Bilhuber-Knoll Corp.

Potassium Bromide-Mallinckrodt

Potassium Bromide-Merck

Sodium Bromide 5 gr. Tablets N. F.-Bisbee

Sodium Bromide-Mallinckrodt

Sodium Bromide-Merck

CAFFEINE

Caffeine-Mallinckrodt

Caffeine-Merck

Caffeine Citrated-Mallinckrodt

Caffeine with Sodium Benzoate Ampoules, 7½ gr.-Abbott

Caffeine Sodio-Benzoate-Mallinckrodt

Caffeine and Sodium Benzoate-Merck

CALCIUM COMPOUNDS

Albacar Precipitated Calcium Carbonates 6328 and NEB 89-C. K. Williams & Co.

Precipitated Calcium Carbonate-Mallinckrodt

Calcium Carbonate U.S.P. Precipitated-Merck

Precipitated Calcium Carbonate Extra Light, Light and Medium-National Gypsum Company

Non-Fer-Al Brand Calcium Carbonate-Diamond Alkali Co.

Peerless Precipitated Calcium Carbonate Extra Heavy Grade 16, Medium Heavy Grade 24, Medium Light Grade 40, Extra Light Featherwate Grade 60-Ste. Genevieve Lime Co.

Snow Top Calcium Carbonate Precipitated Extra Heavy, Heavy, Medium, Light and Super Light—West Va. Pulp and Paper Co.

Precipitated Calcium Carbonate 50, 70, 100 and 130-Sturge

Wyandotte Precipitated Calcium Carbonate[12]

Calcium Chloride-Mallinckrodt

Calcium Chloride-Merck

Calcium Gluconate-Abbott

Calcium Gluconate-Abbott, 1 Gm. Tablets (Flavored)

Calcium Gluconate-Mallinckrodt

Calcium Gluconate-Merck

Calcium Hydroxide-Mallinckrodt

Calcium Hydroxide-Merck

Calcium Lactate-Mallinckrodt

Calcium Lactate-Merck

Dicalcium Phosphate-Monsanto

Dicalcium Phosphate-Victor

Tribasic Calcium Phosphate, U.S.P. Precipitated-Merck

Tricalcium Phosphate-Monsanto

Tricalcium Phosphate-Victor

Chlorcosane-Abbott

Copper Sulfate-Mallinckrodt

Copper Sulfate-Merck

DENTIFRICES

The dentifrices in the following list which are available generally throughout the country are marked with the code letter (G) and some of those which are most commonly sold through outlets other than drug stores are designated by numbered footnote references.

A C Dental Cream

Ace Tooth Paste

Actra Tooth Powder

Advance Tooth Powder (1)*

Afko Brand Dental Powder (G)

Afko Brand Tooth Paste (G)

*Distributed (1) by food stores; (2) by ten-cent and variety stores; (3) by men's shops; (4) by department stores; (G) nationally.

Altman's Tooth Paste (4)
Angert's Tooth Paste
Arm & Hammer Bicarbonate of Soda (G, 1)
Berner's Tooth Paste
Briggs Tooth Powder
Carr's Tooth Paste
Casin Tooth Paste
Cow Brand Bicarbonate of Soda (G, 1)
Craig-Martin Tooth Paste (2)
Craig-Martin Tooth Powder (Foamy Type) (2)
Dental Aid Tooth Powder
Dentosal Dental Cream
Elder's Tooth Paste
Ephraim Dental Cream
Ephraim Dental Powder
Excella Brand Tooth Paste
The Fair Tooth Paste (4)
Gertz Tooth Paste
Gimbel's Tooth Paste (4)
Gold's Tooth Paste
Grand Union Tooth Powder
Grants Tooth Paste (2)
Gray's Tooth Paste
Hales Tooth Paste
Horn's Tooth Powder
Irene's Tooth Powder
Kln-Aid Tooth Powder
Krest Tooth Paste
Lactona Dentifrice (G)
LeBon Tooth Paste
Loveman's Tooth Paste (4)
Marcelle Tooth Paste (G)
McCann Dental Powder
Merrit Brand Tooth Paste
Milk-I-Dent Tooth Paste (G, 2)
Mutual Tooth Powder
Nevins Tooth Paste
Orrin's Tooth Powder
Pogue's Dental Cream (4)
Pro-phy-lac-tic Brand Tooth Powder (G)
Py-co-pay Tooth Powder (G)
Quick's Tooth Paste
Rogers Dental Cream
Sam's Tooth Paste
Sam's Tooth Powder
Saxon Tooth Paste

Schuster's Tooth Paste (4)
Sheffield Tooth Paste (G)
Sheffield Tooth Powder (G)
Stanley Tooth Powder
Stevens-Wiley Tooth Powder
Stratford Tooth Paste
Stratford Tooth Powder
Style King Tooth Paste (3)
S.V.B. Tooth Paste (4)
Swan Tooth Paste
Taylor-Rea Tooth Paste
TMC Tooth Paste (4)
Trade Brand Dental Cream (G)
Tri-Basic Tooth Powder
Victor Tooth Powder
Warren's Tooth Paste (2)
Williams' Dental Powder (G)
Wolf Tooth Paste
Y & S Tooth Paste
Zanol Tooth Paste

DYES

The Acridine Dyes

Acriflavine-Abbott
Acriflavine-Abbott, 0.03 Gm., 0.1 Gm. Tablets
Acriflavine Hydrochloride-Abbott
Acriflavine Hydrochloride-Abbott, 0.03 Gm. Tablets

The Azo Dyes

Biebrich Scarlet Red N.F.-Merck
Ointment Scarlet Red, 5 per cent-P. D. & Co.
Ointment Scarlet Red, 10 per cent-P. D. & Co.

The Triphenylmethane (Rosaniline) Dyes

Crystal Violet-Calco[18]
Brilliant Green-Calco

EPINEPHRINE AND RELATED SUBSTANCES

Epinephrine HCl Solution 1:1000-Abbott
Adrenalin (epinephrine)-Parke, Davis & Co.
Adrenalin Chloride Solution 1:1000-Parke, Davis & Co.
Ampoules Adrenalin Chloride Solution 1:10,000, 1 cc.-Parke, Davis & Co.
Ampoules Adrenalin Chloride Solution 1:2600, 1 cc.-Parke, Davis & Co.
Adrenalin Tablets, 3/200 gr.-Parke, Davis & Co.
Adrenalin Tablets, 1/200 gr.-Parke, Davis & Co.
Adrenalin and Cocaine Tablets-Parke, Davis & Co.

Cobefrin Hydrochloride-Winthrop
Neo-Synephrine Hydrochloride-Frederick Stearns & Co.
Solution Neo-Synephrine HCl, 1 per cent
Suprarenin (Bitartrate)-Winthrop
Suprarenin Bitartrate Solution 1:1000-Winthrop
Suprarenin Tablets-Winthrop
Suprarenin Tablets, 0.02 Gm.-Winthrop
Suprarenin Bitartrate Powder in Ampules-Winthrop

ESSENTIAL OILS AND RELATED PRODUCTS

Eucalyptol-Mallinckrodt
Eucalyptol-Moyco
Eugenol-Merck
Eugenol-Moyco
Eugenol-Regal[14]
Menthol-Mallinckrodt
Methyl Salicylate-Mallinckrodt
Oil Betula (methyl salicylate)-Merck
Oil of Cassia (oil of cinnamon)-Moyco
Oil of Cloves-Merck
Oil of Cloves-Moyco
Oil of Eucalyptus-Merck
Oil of Eucalyptus-Moyco
Thymol-Mallinckrodt
Thymol-Merck
Thymol, U.S.P. Crystals-Moyco

FIBRIN FERMENTS AND THROMBOPLASTIC SUBSTANCES

Fibrogen Local-Merrell
Fibrogen Local-Merrell 7 cc. vials
Thromboplastin Local-Squibb
Thromboplastin Local-Squibb in 20 cc. vials

FORMALDEHYDE PREPARATIONS AND COMPOUNDS WHICH LIBERATE FORMALDEHYDE

Formaldehyde Solution-Mallinckrodt
Solution of Formaldehyde-Merck
Reagent Formaldehyde-Merck, Neutral
Formalin (formaldehyde solution)-Moyco
Formalin (formaldehyde solution)-Schering & Glatz, Inc.
Paraformaldehyde-Mallinckrodt
Paraform (paraformaldehyde)-Moyco
Trioxymethylene (paraformaldehyde)-Merck

GLYCERIN AND RELATED COMPOUNDS

Glycerin-Mallinckrodt
Glycerin-Merck
Propylene Glycol-Dow Chemical Co.
Propylene Glycol-Carbide & Carbon Chemicals Corp.
Atlas Commercial Sorbitol Solution-Arlex Brand[15]

HYPOCHLORITES AND HYPOCHLORITE SUBSTANCES

Solution Sodium Hypochlorite-Merck
Hyclorite[16]

Chloramine Preparations

Azochloramid[17]
Azochloramid in Triacetin 1:500, Solution of
Azochloramid in Triacetin 1:100, Solution of
Chloramine-T-Mallinckrodt
Chloramine-T-Squibb
Chlorazene-Abbott
Aromatic Chlorazene Powder-Abbott
Chlorazene Tablets, 4.6 gr.-Abbott
Dichloramine-T-Abbott

IODINE COMPOUNDS

Preparations Containing Free Iodine

Iodine-Mallinckrodt
Iodine-Merck
Iodine, U.S.P. Resublimed-Moyco
Tincture of Iodine-Mallinckrodt
Tincture of Iodine-Moyco
Mild Tincture of Iodine-Mallinckrodt

Iodine Dusting Powders

Iodoform-Mallinckrodt
Iodoform-Merck
Iodoform Ointment, B.P.C.-Moyco
Iodoform Paste (Aromatic)-Moyco
Aristol (thymol iodide)-Winthrop
Thymol Iodide-Mallinckrodt
Thymol Iodide-Merck

IRON AND IRON COMPOUNDS

Iron Subsulfate-Mallinckrodt
Iron Subsulfate Solution-Mallinckrodt
Monsel's Solution-Moyco (solution of ferric subsulfate)
Solution Ferric Subsulfate-Merck

MAGNESIUM COMPOUNDS

Magnesium Carbonate-Mallinckrodt
Magnesium Carbonate-Merck

Magnesium Oxide, Light-Mallinckrodt
Magnesium Oxide-Merck, Light
Magnesium Oxide-Heavy-Mallinckrodt
Magnesium Oxide-Merck, Heavy
Magnesium Sulfate-Mallinckrodt
Magnesium Sulfate-Merck

MERCURY AND MERCURIAL COMPOUNDS

Corrosive Sublimate-Mallinckrodt
Mercury Bichloride-Merck
Merthiolate-Eli Lilly & Co.
Merthiolate Solution 1:1,000-Lilly
Metaphen-Abbott
Metaphen Solution 1:2,500-Abbott
Metaphen Disinfecting Solution-Abbott
Metaphen Solution 1:500-Abbott
Tincture Metaphen 1:200-Abbott
Discs of Potassio-Mercuric Iodide, Large-P. D. & Co.
Discs of Potassio-Mercuric Iodide-P. D. & Co.
Potassio-Mercuric Iodide Tablets-Bisbee
Potassium Mercuric Iodide-Mallinckrodt

OPIUM DERIVATIVES

Apomorphine Hydrochloride-Merck
Codeine Alkaloid-Mallinckrodt
Codeine Alkaloid-Merck
Codeine Phosphate-Mallinckrodt
Codeine Phosphate-Merck
Codeine Sulfate-Mallinckrodt
Codeine Sulfate-Merck
Morphine Sulfate-Mallinckrodt
Morphine Sulfate-Merck

OXYGEN AND OXIDIZING AGENTS

Superoxol (hydrogen peroxide 30%)-Merck & Co.
Hydrogen Peroxide-Mallinckrodt
Hydrogen Peroxide Solution-Merck
Chromic Acid-Mallinckrodt
Acid Chromic (Chromium Trioxide)-Merck
Chromic Acid, Crystals-Moyco
Sodium Perborate-Mallinckrodt
Sodium Perborate-Merck
Sodium Perborate (Flavored)-Merck
Potassium Permanganate-Mallinckrodt
Potassium Permanganate-Merck
Potassium Permanganate Compressed Tablets, 1, 2, 5 gr.-Rorer

Potassium Permanganate-Squibb
Potassium Permanganate Tablets, 1, 5 gr.-Squibb

PHENETIDINE, AMINOPYRINE, ACETANILID AND SALICYL COMPOUNDS

Acetanilid-Mallinckrodt
Acetanilid-Merck
Acetophenetidin-Mallinckrodt
Acetophenetidin-Merck
Phenacetin with Oral Sodium, Kapseals-Merck
Acetylsalicylic Acid-Mallinckrodt
Acetylsalicylic Acid-Merck
Aspirin Tablets, 5 grains-Abbott
Aminopyrine-Mallinckrodt
Aminopyrine-Merck
Pyramidon-Winthrop
Pyramidon Tablets, 2 gr., 5 gr.-Winthrop
Elixir of Pyramidon-Winthrop

PHENOLIC COMPOUNDS

Cresol-Mallinckrodt
Cresol-Merck
Cresol-Moyco
Compound Cresol Solution-Mallinckrodt
Compound Solution of Cresol-Merck
Creosote-Mallinckrodt
Creosote, Beechwood-Merck
Morson's Kreosote-Moyco
Guaiacol-Mallinckrodt
Guaiacol-Merck
Phenol Solution 90%-Moyco
Carbolic Acid-Mallinckrodt
Carbolic Acid-Merck
Phenol (Carbolic Acid) U.S.P. Crystals-Moyco

Pilocarpine Hydrochloride-Mallinckrodt
Pilocarpine Hydrochloride-Merck
Pilocarpine Nitrate-Mallinckrodt
Pilocarpine Nitrate-Merck

Potassium-Sodium Carbonate Mixture-Bisbee

Rosin and Chloroform-Moyer

Saccharin-Mallinckrodt

Saccharin-Merck
Soluble Saccharin-Mallinckrodt

SILVER PREPARATIONS

Lunar Caustic-Mallinckrodt (Toughened Silver Nitrate)
Silver Nitrate-Mallinckrodt
Silver Nitrate-Merck
Silver Nitrate 10% Solution-Moyco
Silver Nitrate Applicators-Moyco
Ampoules Ammoniacal Silver Nitrate-P. N. Condit

SOAP AND OTHER DETERGENTS

Soft Soap-Merck
Liniment Soft Soap-Abbott
Sulfocolaurate-Emulsol Corp.

Arm & Hammer Bicarbonate of Soda
Cow Brand Bicarbonate of Soda
Sodium Bicarbonate-Mallinckrodt
Sodium Bicarbonate-Merck
Sodium Borate-Mallinckrodt
Sodium Borate (Borax)-Merck
Sodium Chloride-Mallinckrodt
Sodium Chloride-Merck

VITAMINS AND VITAMIN PREPARATIONS

Maltine with Cod Liver Oil[18]
Abbott's Cod Liver Oil
Mead's Standardized Cod Liver Oil[19]
Mead's Flavored Cod Liver Oil
Nason's Palatable Cod Liver Oil[20]
Parke-Davis Standardized Cod Liver Oil
Patch's Cod Liver Oil, Flavored[21]
Squibb Cod Liver Oil
Squibb Mint-Flavored Cod Liver Oil
White's Cod Liver Oil Concentrate (Liquid)[22]
White's Cod Liver Oil Concentrate (Capsules)
White's Cod Liver Oil Concentrate (Tablets)
Mead's Cod Liver Oil with Viosterol
Parke-Davis Cod Liver Oil with Viosterol
Squibb Cod Liver Oil with Viosterol
Squibb Cod Liver Oil with Viosterol-Mint Flavored
Abbott's Haliver Oil with Viosterol
Soluble Gelatin Capsules, Abbott's Haliver Oil with Viosterol
Mead's Viosterol in Halibut Liver Oil

Mead's Viosterol in Halibut Liver Oil (In Capsules)

Parke-Davis Haliver Oil with Viosterol

Soluble Gelatin Capsules Parke-Davis Haliver Oil with Viosterol, 3 minims

Mead's Oleum Percomorphum with Other Fish Liver Oils and Viosterol

Mead's Oleum Percomorphum with Other Fish Liver Oils and Viosterol (in Capsules)

Mead's Cod Liver Oil Fortified with Percomorph Liver Oil

Viosterol in Oil-Abbott

Mead's Viosterol in Oil

Parke-Davis Viosterol in Oil

Viosterol in Oil-Squibb

Winthrop Viosterol in Oil

Lanolin-Mallinckrodt (hydrous wool fat)

Lanum-Merck (hydrous wool fat)

ZINC COMPOUNDS

Zinc Chloride-Mallinckrodt

Zinc Chloride-Merck

Zinc Chloride U.S.P. Crystals-Moyco

Zinc Oxide-Mallinckrodt, Analytical Reagent

Zinc Oxide-Merck Analytical Reagent

Zinc Oxide-U.S.P.-Moyco

Zinc Oxide-Eugenol Cements

Zinc Oxide-Rosin-Eugenol Cement with Menthol and Thymol Iodide-Moyco

Zinc Oxide and Thymol Iodide Cement-Condit and Eugenol with Balsam Peru-Condit

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1. Mallinckrodt Chemical Works, St. Louis, Mo.
2. Merck & Co., Inc., Rahway, N. J.
3. J. Bird Moyer Company, Philadelphia, Pa.
4. Algin Corp. of America, N. Y.
5. Lederle Laboratories, Inc., New York, N. Y.
6. Abbott Laboratories, North Chicago, Ill.
7. Parke, Davis & Company, Detroit, Mich.
8. Hammer Laboratories, Chicago, Ill.
9. Austin Mfg. Co., Chattanooga, Tenn.
10. R. F. Bisbee, Minneapolis, Minn.
11. Bilhuber-Knoll Corp., Orange, N. J.
12. Michigan Alkali Co., Wyandotte, Mich.
13. Calco Chemical Div., American Cyanamid Co., Bound Brood, N. J.
14. Regal Dental Co., Brooklyn, N. Y.
15. Atlas Powder Co., Wilmington, Del.
16. Pennsylvania Salt Mfg. Co., for Bethlehem Labs., Bethlehem, Pa.
17. Wallace and Tiernan Products, Inc., Belleville, N. J.
18. The Maltine Co., New York.
19. Mead Johnson & Co., Evansville, Ind.
20. Tailby Nason Co., Boston, Mass.
21. The E. L. Patch Co., Boston, Mass.
22. White Laboratories, Inc., Newark, N. J.

TOPICAL MEDICATION

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THE Council on Dental Therapeutics has authorized publication of this report as one of the series on pharmacology and therapeutics. The opinions expressed are those of the author and do not necessarily reflect the opinion of the Council.

DONALD A. WALLACE, *Secretary.*

DRUGS may be administered to any of the accessible tissues or cavities of the body. They may be applied topically (locally) or internally, according to the requirements. Those used topically are intended to have a local effect; those used internally, to have a systemic effect, after absorption.

The unbroken skin is not a highly absorptive tissue. Drugs applied topically are generally not absorbed into the circulation, with such exceptions as mercury ointment applied by inunction, the drug being absorbed and an antispirochetal action resulting. Other agents capable of absorption are: iodine, applied as a tincture or solution, methyl salicylate, estrone and probably certain glycols, but not glycerin. (Hanzlik.) The resistance of the skin to drug absorption is due to the protection offered by the horny layers of the epidermis and by the sebaceous secretions, which prevent the ready penetration of aqueous solutions. Oils and volatile substances therefore diffuse more readily through the skin. Strackosch[1] found that the liquid oils are more readily absorbed than the solid fats. The animal fats had the greatest depth of penetration, the vegetable fats next and the mineral oils the least. In the young individual, the penetration of fats is better than in the old. The ointments never penetrated deeper than the stratum corneum. Absorption occurs more readily from areas where the cornified epithelium is generally thinner; i.e., under the arms. The drug probably enters the hair follicles and ducts of the sebaceous and sweat glands, where absorption slowly takes place.[2] The deeper layers of the skin absorb drugs more readily, and, in the past, the endermic method of drug administration was used. Blisters, poultices, liniments, powders, lotions and collodions are examples of preparations intended for local use. At present, we may conclude that the application of drugs to the skin with the intention of causing absorption is not in vogue. This practice may change with a better understanding of dermal function and the discovery of better solvents. Aqueous preparations of drugs are quickly absorbed by the mucous membrane, while fatty substances are absorbed to a lesser extent from these moist surfaces. Isotonic solutions of drugs cause less irritation to sensitive mucous membranes than do other solutions. The hypotonic preparation should be made isotonic by adding sufficient quantities of sodium chloride. The viscosity of the liquid preparation is the important factor in holding the drug on the surface of the tissues. The use of solvents that precipitate the mucous films tends to fix the bacteria and the débris on the surface, preventing them from being carried into the tissue during an injection or incision. Drug preparations intended for local application to the oral mucous membranes are generally in the form of tinctures, solutions, ointments or powders. Preparations intended for treating oral disturbances may be applied as mouth washes, special medicated dentifrices, gargles, paints, lozenges, poultices,

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powders, pastes or sprays. The application of remedies to the mucous membranes of the gastro-intestinal tract is generally, but not necessarily, intended for a local action; as with emetics, carminatives, antacids, cathartics, intestinal antiseptics and antidotes. Application of volatile drugs about the nose and mouth may have a systemic effect, the application of ethyl chloride as a refrigerant anesthetic being a good example. For the absorption of drugs from the mucous surfaces directly into the general circulation, Paulson regards the sublingual space as the most reliable surface of the whole body. The drug does not pass through the liver before circulating to the various tissues. This route is useful to assure the systemic effect of treatment with glyceryl trinitrate and certain hormones.

In dentistry, the topical application of drugs to the oral tissues is extensively practiced. The drugs may be intended for local effects only, e.g. topical antiseptics, but they may be absorbed, with a systemic effect. The antiseptics, astringents, caustics, counterirritants, obtundents, protectives, etc., are applied for a topical action, although there is always the possibility of the drug's being absorbed. The absorption of the drug by the mucous membranes does not necessarily have a systemic effect. The drug may be destroyed by the tissues as fast as it is absorbed; or the concentration of the drug in the tissues may be too limited to have an effect. The mere absorption of the drug into the tissues is of academic interest only, while absorption plus effect is of therapeutic and toxicologic importance.

Medicinal agents are occasionally applied to the mucous membranes and teeth with the aid of an electric current. The process is known as cataphoresis, or ionic medication. The procedure is given in detail by Hermann Prinz.[3]

The application of drugs to the teeth for topical action is frequently practiced in dentistry. The enamel behaves as a non-vital tissue, and drugs are seldom applied for therapeutic purposes. There are exceptions, such as the application of silver nitrate or sodium fluoride for the prevention and control of dental caries. Drugs are often applied to the dentin for their antiseptic, obtundent, anesthetic, caustic or bleaching action. There is little danger of toxic reactions from application of the small amount of drug used on the dentin, even though it does reach the dental pulp. The cementum also resembles bone as to vitality and powers of repair. Drugs are seldom applied to the cementum, the exceptions being antacids, obtundents and caustics.

The dental pulp is a living tissue, with a nerve, blood and lymph supply. This organ functions as long as the tooth is vital, playing a rôle in the growth, repair, nutrition, sensation and protection of the tooth. Drugs are applied to the dental pulp to act as antiseptics, caustics, protoplasm poisons, obtundents, anesthetics, protectives, hemostatics, etc. There is always a danger that the drug may be absorbed by the vascular tissue, although the amount of drug used in pulp therapy is generally so small that any toxic reaction is practically negligible. Protoplasm poisons such as arsenic trioxide have been known to pass through the apical foramen and destroy the periodontal tissue.

Drugs are still applied to the oral cavity without much consideration of toxicity. There are, of course, reasons for this attitude. The dentist generally does not use extremely toxic drugs, nor does he apply them often enough that the effect becomes cumulative. The acceptance of these facts does not preclude the danger from overdosage of toxic drugs, an unsuspected allergy or a pronounced caustic action. The use of preparations in and about the mouth, especially such cosmetics as lipstick, facial creams, dentifrices, oral washes and lozenges, is always a potential source of danger, as toxic ingredients may be ab-

sorbed or an allergic reaction occur. These preparations are used daily, and the possibility of cumulative action or allergy is more prevalent than is generally appreciated.

A study of the literature reveals information regarding the therapeutics and toxicity of many of the drugs and preparations used topically in oral medicine. For convenience of organization, the drugs will be considered in groups.

The halogens are a group of active elements that are extensively used in oral medicine. The members of this group are fluorine, bromine, chlorine and iodine. The last two are used as elements, while all four are used as compounds. The application of fluoride salts to the teeth for the prevention and control of dental caries is a comparatively new procedure. As the fluorides are toxic compounds, the safety of this practice is questionable. The work of Bibby[4] on children in the environs of Boston will be used as an example and an analysis made as to safety. These workers applied a 0.1 per cent solution of sodium fluoride to the children's teeth three times a year by means of a cotton pellet held in dental tweezers. The teeth were isolated with cotton rolls and the mouth rinsed well with water after the application. Each 5 cc. of the 0.1 per cent solution of sodium fluoride represented 5 mg. of the salt or less than 2.5 mg. of the element fluorine. Sollmann[5] gives the toxicology of sodium fluoride as follows: A single dose of 250 mg. has produced toxic symptoms in man, recovery followed 0.5 gram, and death was caused by a single dose of 4 grams. Therefore, there seems to be little or no danger of fluoride toxicity in children treated under conditions simulating that of the Boston group.[6, 7] With fluoride, the acute toxicity is not so important as the chronic toxicity. It is interesting to note that in fluoride endemic areas the content of fluoride in the drinking water is from 1 to seldom more than 10 parts per million.[8] If these individuals drank one and a half liters of water containing 10 parts per million of fluoride a day, the daily intake would be only 15 mg. In these endemic areas, there is always the possibility of additional fluoride being ingested with the diet. To my knowledge, no toxic symptoms other than mottling of the enamel have been reported on this daily intake. It should be remembered that mottling of enamel is produced only in teeth that are in the process of enamel formation during the period when the fluoride is being ingested; that is, in children and not in adults. The lack of mottled enamel in the deciduous teeth is very interesting. As these teeth form their enamel during intra-uterine life, it appears that the fluorides ingested by the mother do not pass through the placental barrier.

The addition of fluorides to the drinking water as suggested by Cox and Levin[9] for controlling dental caries cannot be considered safe at this time. While much work has been done and much has been published on dental fluorosis, there is little information in the literature to show the chronic effects of this element on the other tissues. There is a possibility that fluoride may be incorporated in mouth washes, dentifrices, lozenges and chewing gum, if this is not prohibited by law.

The application of sodium fluoride to exposed dentin for the control of hypersensitivity of the teeth is a new use for this compound. Hoyt and Bibby[10] give the following procedure for its use in the treatment of hypersensitive dentin, and for the control of pain in cavity preparation. The area to be treated is isolated with cotton rolls. A pledget of cotton is used to dry the area and another pledget is saturated with a 4 per cent solution of sodium fluoride and is applied to the sensitive area. A small amount of sodium fluoride paste is then rubbed vigorously into the area with a plastic instrument until the sensitiveness disappears, the

time varying from one to five minutes. The excess paste is wiped off and the area flushed with water and rinsed by the patient. The procedure may be repeated as often as is necessary. The formula for the paste is sodium fluoride 1 part, white clay 1 part and glycerin 1 part. The few tests carried out in our clinic suggest that the procedure has merit, but only time will tell its degree of efficiency for controlling the pain of sensitive dentin.

The use of sodium fluoride for controlling recurrence of decay in prepared cavities is another possible dental application of this drug, a 0.1 per cent solution being used in the prepared cavity before the filling is inserted. Care must be exercised to prevent excessive pain following the application of concentrated preparations of sodium fluoride to sensitive dentin. The chronic effect on the dental pulp from these preparations has not been determined: time alone will tell. Great care must be exerted to prevent the patient from swallowing these concentrated sodium fluoride preparations. A 4-grain dose may cause toxic symptoms. It therefore seems advisable to treat only one tooth at a time when the concentrated preparations are being applied and to use all possible precautions to prevent the drug from coming in contact with the soft tissues or being swallowed.

The application of iodine to the oral tissues by the dentist is not a dangerous procedure. The amount of iodine absorbed through the oral mucosa or from the swallowed portions is too small to be toxic. There is danger that the iodine and alcohol may injure the tissues locally. Tincture of iodine, U.S.P., contains 7 per cent iodine and about 85 per cent alcohol, both of which are in concentration too strong for oral use. The stronger tincture of iodine, N.F., known to the dental profession as Churchill's tincture of iodine, contains 16.5 per cent iodine and about 63 per cent alcohol. This preparation is an iodine caustic of little or no therapeutic value and has no place in dentistry. Mild tincture of iodine, U.S.P., is a 2 per cent solution of iodine in about 46 per cent alcohol. This preparation is ideal as an iodine antiseptic for oral use. Solution of iodine, U.S.P., is a new iodine preparation containing 2 per cent of iodine in water. This is a good oral antiseptic for topical use on the soft tissue. It is also satisfactory as a disclosing solution.

Compound dental liniment of aconite and iodine, N.F., is composed principally of iodine, 2 per cent; chloroform, 30 per cent; fluidextract of aconite, 25 per cent, and alcohol, 40 per cent. The fluidextract of aconite is the only drug present in toxic concentration, having an official dosage of 1 minim. Therefore, for every 4 drops of the liniment applied, the N.F. dosage is potentially administered. Aconite acts locally on the oral mucosa, causing a feeling of warmth, tingling and numbness.

Larger doses will first stimulate the medullary centers and finally depress them, resulting in a slow heart beat and a lowered blood pressure. This drug has no place in dentistry either alone or in combinations. Goodman and Gilman[11] state that "owing to the possibility of absorption and toxic systemic effects, aconite should not be employed on the surfaces of the body." This is another iodine preparation that should be deleted from the N.F. VIII.

Organic iodine preparations that slowly liberate active iodine are used as bacteriostatic agents. The value of these compounds over the tinctures is in the duration of action; i.e., they exert a bacteriostasis for hours, whereas the tincture may act for only minutes. The absorption of iodine from these organic preparations is always a possibility. In dentistry, where only small amounts of the drug are used and the number of applications are few, the relative danger of toxicity is small. The official organic

iodine preparations useful in dental practice are: iodoform, N.F., and thymol iodide, U.S.P. Inert organic iodine preparations are now official and employed for roentgenologic examination. The drugs are non-toxic and are radiopaque, giving a shaded outline to an otherwise undifferentiated soft tissue. Their use in dental diagnosis should be considered.

The chlorine compounds used topically in dentistry are not toxic systemically, but may act as local caustics. The inorganic chloride salts, in which the chlorine occurs as the negative chloride ion (Cl^-), act locally by osmosis and/or acidity; i.e., sodium chloride and ammonium chloride. This chloride ion is not very reactive chemically with organic matter and therefore does not give the characteristic chloride action. In inorganic chlorine compounds, wherein the chloride is positively charged, as in sodium hypochlorite (NaOCl), the chlorine is active and readily combines with organic matter. This chlorine (Cl^+) is positive in relation to oxygen, and only positive chlorine is actively antiseptic.

The official preparations which contain active chlorine are: solution of sodium hypochlorite, U.S.P., diluted solution of sodium hypochlorite, N.F., chloramine-T, U.S.P., chloroazodin, U.S.P., solution of chloroazodin, U.S.P., and dichloramine-T, N.F. These preparations are unstable and must be freshly prepared to give the best results. For dental use, the powdered chloramine-T may be used in a 1 to 2 per cent aqueous solution for the irrigation of infected tissue. These preparations act as antiseptics and as detergents.

The bromine salts have no topical action and therefore are not discussed in this article.

The metallic salts are extensively used in the oral cavity as antiseptics, astringents, caustics, hemostatics and protectives. There are very few cases on record of a general toxicity resulting from the oral use of these salts, but there is always the possibility of cases of chronic poisoning which has not been diagnosed.

The toxicity of molecular and ionic mercury preparations used in dental practice is a subject of much speculation and some careful study. Storazzi and Elkins[12] made a brief study of the absorption of mercury from silver amalgams. They tested the urine for the presence of mercury following the use of mercury-containing fillings and found that its presence could be detected in from one to four days. They concluded from their work that the mercury absorption was too small (0.104 mg. per hundred cubic centimeters) to be toxic. Hayes[13] states that "some people are so susceptible to the drug (mercury) that a single dose of calomel may bring on an attack of stomatitis." In 1925, Stock postulated that the human race was menaced by the use of mercury in dental restorative materials. An examination of the school children of Berlin, who were receiving dental services in the school clinics, was made to confirm or disprove Stock's contentions. While small amounts of mercury could be detected in the urine of these children, it was not sufficient to act as a toxic substance.[14]

Souder and Sweeney,[15] in their excellent paper, apparently refuted the theory that appreciable amounts of mercury vapor were given off by dental amalgams in the oral cavity. Their statement that "these eroded particles do not yield solutions of mercury"[16] is questionable from a biochemical standpoint and cannot be entirely accepted until proved by animal experimentation. Traub and Homes[11] report cases of dermatitis and stomatitis from the presence of mercury in dental restorative materials. The reaction apparently came from the contact of mercury with the soft tissues and not from mercury absorption. The skin apparently is more susceptible than the mucous membranes to mercury exposure. The authors believed that, even though particles of mercury and the restorative

material were swallowed, the absorption of mercury was questionable. The reactions followed the insertion of mercury-containing materials into the teeth and eventually ceased, even though the causative agents were not removed. The dermatitis and stomatitis, which appeared within a few hours after exposure, were localized to the tissues in contact with the agent. Patch tests in these patients gave positive skin reactions. Dentists are known to develop a susceptibility to mercury from its continued use.

The authors conclude that (1) the danger to the patient from silver amalgam restorations is remote; (2) copper amalgam restorations may cause reactions in susceptible individuals; (3) acute dermatitis and stomatitis from amalgam restorations are more prevalent than the literature would indicate, and (4) the skin is more reactive than the mucous membrane to mercury. Judging from the evidence in the literature, the dentist may feel free to use silver and copper restorations without fear of causing mercurialism in the patients. The careless handling of mercury preparations and the possibility of hypersusceptibility must always be considered as potential dangers.

The absorption of mercury from ointments applied to the skin continuously for a few weeks was demonstrated by Wilber.[18, 19] This report shows the potential danger of using mercury preparations on the face and lips.

The use of mercury salts in mouth washes is not extensively practiced. There are still practitioners who prescribe mercuric chloride as a mouth wash for Vincent's stomatitis. A typical prescription, found in Prinz' text,[20] contains from one-fifth to one-half grain of mercuric chloride per ounce. The U.S.P. dosage of this salt is one-sixth of a grain, suggesting that the danger of toxic reactions from the use of this concentration of mercury in mouth washes for a short time is questionable. However, such oral preparations should be considered potentially toxic, should be used only on the prescription of a dentist, should not be used daily for any length of time and should not be swallowed.

The organic mercurial antiseptics and germicides were introduced into therapeutics as non-irritating mercury compounds. The mercury ionizes little if at all; therefore, it cannot have a characteristic mercury-ion action and is less toxic when absorbed into the general circulation. Ellis and Robinson[21] report cases of dermatitis due to contact with merthiolate. Belote and Marshall[22] report similar cases with metaphen; Lawrence and Strauss[23] with potassium mercuric iodide, and Pascher and Silverberg[24] with mercurochrome. These papers present evidence that the organic and some inorganic mercurials are toxic to sensitive individuals and must be used with care. The dentist should be alert for untoward reactions to these drugs and stop their use whenever a sensitivity exists. Chemical disinfecting agents[25] that contain mercury may be toxic to certain individuals, unless the solution is completely removed from the instruments before they are used.

Accidental explosions from the handling of ammoniacal silver nitrate have been reported by Smith.[26] In all cases, the silver solutions had been allowed to stand for from eighteen hours to three or more weeks, until a brown precipitate had formed. The explosion may occur with or without agitation and shows the danger of prepared solutions. As dentists frequently have prepared solutions of ammoniacal silver nitrate in the dental office, care must be exercised in the keeping and use of this solution. There is no record of ammoniacal silver nitrate explosions in the dental literature of this country.

Topical anesthesia in dentistry has not been so successful as in the medical specialties, such as nose and throat surgery. The oral mucous membranes, with their layers of stratified squamous epithelium and covering of thick viscid saliva, are

evidently not designed for easy penetration by drugs.[27] As practically all of the synthetic local anesthetic drugs are vasodilators, they have a tendency to be diluted in the tissues and to be removed by the blood and lymph before profound anesthesia develops. When aqueous solutions are used, the mucous membranes should be wiped dry before application of the drug. Because of these retarding influences, the drug must be applied in a concentrated solution, from 10 to 20 per cent. "As time is necessary for an injected anesthetic to produce anesthesia, time is likewise necessary for a surface anesthetic to take effect."[28] The time necessary with the following procedure is from four to five minutes: The area is dried with a gauze sponge, and a cotton pellet saturated with the anesthetic solution is applied to the tissues and held firmly in place from four to five minutes. The pH of the anesthetic solution is important in many instances.[29] This is particularly true of procaine hydrochloride, which, when made alkaline with sodium bicarbonate, gives profound surface anesthesia in a 20 per cent solution. The optimum pH for procaine hydrochloride[28] is about 8. The concentration of anesthetic drug is important from a toxicologic standpoint, as administration of many of the anesthetic drugs can cause poisoning if they are not used cautiously. This is true for butyn, cocaine and tutocaine. Therefore, for the sake of safety, procaine in a 20 per cent solution and when used as an alkaline solution is probably the drug of choice for topical anesthesia, although butyn (10 per cent) is more extensively used.[30]

The concentration of alcohol in an anesthetic solution should not be greater than 10 per cent if it is to be applied as previously directed. Dentistry is in need of a safe and efficient topical anesthetic. To date, I know of no drug or preparation that meets all the requirements. Perhaps in the future a new drug or a new solvent[31] for an old drug will afford a preparation that will serve the many useful purposes to which a topical anesthetic for the oral mucous membranes can be put.

The following formula has been used, but it may be irritating to the oral mucous membranes because of its alcohol content:

Benzocaine	10 Gm.
Alcohol	70 cc.
Water q.s. ad.	100 cc.

Topical anesthetics for the dentin, while desirable, are not very efficient. While dentin conducts pain impulses to the dental pulp and thus to the centers of consciousness, the exact mode of excitation and transmission has not been determined. The local anesthetic drugs are not very satisfactory dentin anesthetics. They have been applied topically, ionically and with pressure, with none too gratifying results. The caustic preparations, such as silver nitrate, are apparently best. Hartman's solution is the best preparation for topical use that I have studied.[32] It is efficient in less than 40 per cent of the cases, working best in children's teeth and in Class V cavities. The preparation must be fresh, correctly made and applied according to directions. While Hartman's solution is not the ideal topical anesthetic agent for the dentin, it is an adjunct for "painless dentistry" and may be employed in selected cases until a better preparation is suggested. (See sodium fluoride.)

Topical anesthesia of the pulp is sometimes resorted to. Application of a procaine hydrochloride pellet (hypodermic) plus a drop of water to the exposed pulp and pressure to force the anesthetic solution into the pulp tissue is a procedure that has good results. This method for pulp anesthesia cannot take the place of injection anesthesia, which is by far the superior method.

The use of solvents in dental preparations is complicated by priorities and the war demands. The use of glycerin in tooth pastes as a moistening agent and

binder is a good example. Now that glycerin cannot always be obtained in large quantities, some manufacturers are forced to use substitutes. Syrups of certain monosaccharides and disaccharides are being used, but this procedure is frowned upon by the Council on Dental Therapeutics for obvious reasons. Ethylene glycol has been condemned because of its toxicity, and propylene glycol has not always been available in sufficient quantity to fill all dentifrice requirements. Sorbitol has been suggested and may prove to be a good substitute for glycerin in dentifrices. The pharmacists can obtain amounts of glycerin which will be adequate for prescription needs. Glycerin is mildly irritating to the mucous membranes, but is not caustic and may be used, when obtainable, wherever a solvent, moistening agent or binder is needed.

The use of alcohol as a vehicle and solvent for oral preparations is common. Many of the tinctures and fluidextracts used on the oral tissues contain alcohol up to 87 per cent. Besides those mentioned, the uses of alcohol in oral preparations are as an antiseptic, astringent, counterirritant and caustic. The type of action obtained depends on the type of tissue, the concentration of the alcohol and the time of exposure. As a vehicle for local anesthetics, which are held on the tissues for five minutes, a 10 per cent solution is the maximum concentration. Not over a 20 per cent solution should be used in a mouth wash, and, for a topical application, 50 per cent or less is best. While the use of alcohol for medical purposes has been restricted, there is still enough for prescription purposes. The ethyl alcohol substitution product that is generally used is isopropyl alcohol. This is a good substitute, having similar physical, chemical and pharmacodynamic properties. It is oxidized in the body at about the same rate and is probably no more toxic. It cannot be advocated for systemic use, but may be used locally with impunity. The dentist needing alcohol 70 per cent for office use may purchase isopropyl alcohol as "rubbing alcohol" at a nominal price in any drug store. According to Tainter *et al.*,[33] the maximal antiseptic efficiency of isopropyl alcohol is obtained with a 50 per cent concentration.

Chloroform is sometimes used as a solvent for dental preparations. On the mucous membrane, it acts as an irritant and is therapeutically applied as a counterirritant. It must be used cautiously to prevent injury of the sensitive tissues. As a solvent in preparations for the hard tissues of the teeth, it is safe in any concentration, causing pain by its refrigerant action only.

The use of the sulfonamide drugs for topical medication is now a common dental practice. The drug is applied as a powder, as a suspension or as a solution. The drug is absorbed by the mucous membrane or abraded areas, and the local concentration of the drug in the tissues is many times greater than can be obtained by systemic administration.[34] As the amount of drug applied topically in the mouth is necessarily small, the probability of direct systemic reaction is minimized. This safety is essential since the average dentist does not have the time or equipment to make the blood analysis that would otherwise be necessary. However, reports appearing recently in the scientific literature[35] seem to indicate that there is a definite possibility of sensitization of patients following the topical application of sulfonamide preparations. The implications of this are obvious in that a patient who is sensitized by a topical application might be deprived of the benefit of the drug at some later time when it might be needed in the treatment of a serious disease or infection.

Tablets or powder, sterile or otherwise, alone or combined with other substances, are applied to the infected area. The United States Pharmacopoeia XII gives a technic for sterilizing the official

sulfonamide powders, but, for dental office use, the sterile powder is marketed and is the more convenient. For the skin, the powder may be combined with castile soap (5 per cent) and used for all toilet needs. As an ointment for the skin, the drug may be combined (5 per cent) in a base of equal parts of hydrous wool fat and vanishing cream.

Ackman and Wilson[36] advocate an emulsion for local application consisting of:

Sulfonamide drug	5 per cent
Triethanolamine	2 per cent
Distilled water	24 per cent
White beeswax	5 per cent
Paraffin	64 per cent

Gauze may be impregnated with this preparation and placed on or in the wound.

Adams[37] has the following to say regarding the selection of the sulfonamides for local use. Neoprontosil (a proprietary name for azosulfamide) has no local action. Sulfapyridine and sulfadiazine are both insoluble in water and may persist in the tissues long enough to act as foreign body irritants; therefore, neither is recommended for local use. Sulfathiazole has a bacteriostatic action, is soluble enough to be absorbed by the tissues and is less prone to act as a foreign body. Sulfaguanidine has not been shown to have any value when applied locally. The soluble salts of both sulfanilamide and sulfathiazole are strongly alkaline (pH 10 to 11) and are caustic. Adams continues to say that it is doubtful whether any sulfonamide possesses an advantage for local use over sulfanilamide, with the possible exception of sulfathiazole, which is more specific against staphylococcus. Hawking[38] considers sulfathiazole superior to sulfanilamide for local use. Ostrander, [39] in a later article, considers sulfathiazole or sulfanilamide to be the drug of choice. On this point, the literature does not agree.

The healing process is generally not retarded by the direct application of small amounts of the sulfonamide drug powders. At times, it appears that the healing is adversely affected, but this is thought to be only temporary.[40, 41] Bick[42] concluded that sulfathiazole and sulfapyridine, but not sulfanilamide, slightly inhibited fibroblastic proliferation and, unless infection is suspected, the local use of sulfonamides applied as a powder is not indicated. At this time (September 1943), the majority of the dental papers are in agreement with Bick's conclusions. Levy,[43] in a paper entitled "Improvement on the Procedure of Topical Application of the Sulfa Drugs," suggests the following procedure: The alveolus is cleaned of blood and exudate with a sterile sponge. The sterile powder is placed on or in the wound and covered with a sponge which has been saturated with mineral oil. Pressure is exerted by having the patient bite down on the sponge, which forces the sulfa drug out into the tissues. The sponge is held in place for at least half an hour, and the drug not disturbed by rinsing for four or more hours.

Solutions of the sulfonamides are advocated for irrigating infected tissues in and about the teeth and jaws. The drug is non-irritating and its use in a saturated solution in water or, better, in a physiologic solution of sodium chloride, causes no pain. If a viscid solution is desired, a 5 per cent suspension of the drug in glycerin is satisfactory. The solution acts as a detergent and bacteriostatic. "The bactericidal power of sulfanilamide is greatly increased by only a slight increase in temperature."[44] While the solubility of the sulfa group is not appreciably changed by the increase in temperature, the increase in bacteriostasis makes the use of warm (140° C.) irrigations of greater therapeutic value. The use of "hot" solutions of sulfanilamide, 6 per cent solution at 140° C., in root-canal therapy, is described by Adams.[45]

The use of strong acids in the oral cavity requires care to prevent decalcifi-

cation of the hard tissues of the teeth. Many of the acid salts will likewise decalcify the teeth. Such acids as acetylsalicylic, benzoic and salicylic are weakly corrosive to the teeth owing to their low solubility in saliva, while lactic and acetic acids are very soluble and hence more destructive and require greater caution in their use. The inorganic acids, except boric acid, are also decalcifying agents and, when they are used orally, the teeth must be protected. Chromic acid is one of the chief offenders.[46] Its application to the gingival tissues is often the cause of hypersensitivity of the cervices of the teeth. The acid evidently exposes sensitive dentin to the oral fluids and débris, pain resulting from heat, cold, acids, salts and sweets. Prevention is better than treatment. When chromic acid is to be used, the adjacent teeth should be protected with oils or varnishes and the acid kept off the teeth as nearly as possible. A mouth rinse of 2 per cent sodium bicarbonate, following the application, is advisable. Chromic acid in a 3 per cent solution in water is adequate for all oral needs.

An attempt has been made in this paper to rationalize the use of drugs in oral topical medication. There is a current trend in dental medicine toward drug nihilism, which is the normal reaction of the dentist against the present injudicious use of drugs. Out of this change is coming a new dental materia medica containing some of the old reliable drugs and a few new drugs. Dental therapeutics is evolving from the old empiric practice to rational practice, where the indication for drug usage is based on an understanding of pharmacodynamics, physiology, bacteriology and pathology.

BIBLIOGRAPHY

1. STRACKOSCH, E. A.: Studies on Ointments. *J. Pharm. & Exper. Therap.*, 78:65-71, May 1943.

2. HARRY, R. G.: Skin Penetration. *Brit. J. Dermat.*, 53:65, March 1941.

3. PRINZ, HERMANN; RICKERT, U. G., and DOBBS, E. C.: Pharmacology and Dental Therapeutics. St. Louis: C. V. Mosby Co., Ed. 8, 1941, p. 55-60.

4. BIBBY, B. G.: New Approach to Caries Prophylaxis. *Tufts D. Outlook*, 15:4, May 1942.

5. SOLLMAN, TORALD: Manual of Pharmacology. Philadelphia: W. B. Saunders Co., Ed. 6, 1942, p. 945.

6. LIDBECK, U. L.; HILL, I. B., and BEEMAN, J. A.: Acute Sodium Fluoride Poisoning. *J.A.M.A.*, 121:826, March 13, 1943.

7. LARGENT, E. J., and MOSES, J. B., JR.: Topical Application of Fluoride and Fluoride Absorption. J.A.D.A., 30:1246, August 1, 1943.

8. DEATHERAGE, C. F.: Mottled Enamel from Standpoint of Public Health Dentist, in Fluorine and Dental Health. (F. R. Moulton, Ed.) A.A.A.S. Publ. 19, 1942. p. 84.

9. COX, G. J., and LEVIN, M. M.: Résumé of Fluorine-Caries Relationship, in Fluorine and Dental Health. (F. R. Moulton, Ed.) A.A.A.S. Publ. 19, 1942, p. 732.

10. HOYT, W. H., and BIBBY, B. G.: Use of Sodium Fluoride for Desensitizing Dentin. J.A.D.A., 30:1372, September 1, 1943.

11. GOODMAN, LOUIS, and GILMAN, ALFRED: Pharmacological Bases of Therapeutics. New York: Macmillan Co., 1941, p. 575.

12. STORAZZI, D. C., and ELKINS, H. B.: Mercury Absorption from Mercury-Bearing Dental Fillings and Antiseptics. *J. Indus. Hyg. & Tox.*, 23:459-465, December 1941.

13. HAYES, L. V.: Clinical Diagnosis of Diseases of Mouth. New York: Dental Items of Interest Publishing Co., 1936, p. 34.

14. PRINZ, HERMANN, and GREENBAUM, S. S.: Diseases of Mouth and Their Treatment. Philadelphia: Lea & Febiger, 1939, pp. 218-220.

15. SOUDER, WILMER, and SWEENEY, W. T.: Is Mercury Poisonous in Dental Amalgam Restorations? *D. Cosmos*, 73:1158, December 1931.

16. *Idem:* P. 1150.

17. TRAUB, E. F., and HOMES, R. H.: Dermatitis and Stomatitis from Mercury of Amalgam Fillings. *Arch. Dermat. & Syph.*, 38:349, September 1938.

18. WILBER, C. L. JR.: *J. Pediat.*, 20:89-92, January 1942.

19. SOLLMANN, TORALD; COLE, H. E., and SCHREIBER, N. E.: Mercury Inunction. *Arch. Dermat. & Syph.*, 32:242, August 1935.

20. Reference 3, pp. 143-144.

21. ELLIS, F. A., and ROBINSON, H. M., JR.: Cutaneous Sensitivity to Merthiolate and

Other Mercurial Compounds. *Arch. Dermat. & Syph.*, 46:425-430, September 1942.

22. BELOTE, G. H., and MARSHALL, D.: Metaphen Dermatitis. *J. Michigan M. Soc.*, 34:172, March 1935.

23. LAWRENCE, J., and STRAUSS, M. J.: Dermatitis Due to Potassium Mercuric Iodide. *Arch. Dermat. & Syph.*, 30:76, July 1934.

24. PASCHER, F., and SILVERBERG, M. G.: Hypersensitivity to Mercurochrome Shown by Patch Test. *Arch. Dermat. & Syph.*, 27:408, March 1933.

25. BREWER, J. H.: Antibacterial Effects of Organic Mercurial Compounds with Special Reference to Use as Germicides for Sterilization of Surgical and Dental Instruments. J.A.D.A., 27:276, February 1940.

26. SMITH, G. S.: Danger Attending Use of Ammoniacal Solution of Silver Nitrate. *J. Path. & Bact.*, 55:227, April 1943.

27. TAINTER, M. L., and MOOSE, S. M.: Practical Value and Limitations of Topical Anesthesia in Oral Surgery. J.A.D.A., 23: 309, February 1936.

28. DOBBS, E. C.: Procaine Hydrochloride as Surface Anesthetic. *D. Cosmos*, 78:812, August 1936.

29. GWINN, C. D., and FERBER, E. W.: Relationship of Hydrogen Ion Concentration to Efficiency and Toxicity of Local Anesthetic Solutions. J.A.D.A., 24:1298, July 1936.

30. TAINTER, M. L.; THRONDSQN, A. H., and MOOSE, S. M.: Studies of Topical Anesthesia. J.A.D.A., 24:1480, September 1937.

31. TAINTER, M. L.: Dentin and Surface Anesthesia in Dentistry. (Paper presented before the Southern California State Dental Association, October 16, 1939.)

32. DOBBS, E. C.: Clinical Report on Use of Hartman's Solution. *D. Cosmos*, 78:548, May 1936.

33. TAINTER, M. L., *et al.*: Chemical Sterilization of Instruments. J.A.D.A., 31:479, April 1, 1944.

34. MEACHAM, P. L., and OSGOOD, E. C.: Efficiency of Local Use of Sulfathiazole Powder in Dentistry and Oral Surgery. J.A.D.A., 28:1640, October 1941.

35. COLE, H. F.: Local Use of Sulfonamide Compounds in Dermatology. J.A.M.A., 123: 411, October 16, 1943.

36. ACKMAN, D., and WILSON, G.: *Canad. M. A. J.*, 46:209, March 1942.

37. ADAMS, F. R.: Hot Solutions of Sulfonamides. J.A.D.A., 30:58, January 1, 1943.

38. HAWKING, F.: *Lancet*, 1:786, June 21, 1941.

39. OSTRANDER, F. D.: Sulfonamides in Dentistry. J.A.D.A., 30:1829, December 1, 1943.

40. SINCLAIR, J. A.: *Bull. N. Carolina D. Soc.*, 23:16, January 1940.

41. SINCLAIR, J. A., and BARKER, O. C.: *New York J. Dent.*, 11:280, July-August 1941.

42. BICK, E. M.: *J.A.M.A.*, 118:511, February 14, 1942.

43. LEVY, A. F.: Improvement on Procedure of Topical Application of Sulfa Drugs. J.A.D.A., 30:1045, July 1943.

44. ADAMS, F. R.: Hot Solutions of Sulfonamides. J.A.D.A., 30:58, January 1, 1943.

45. ADAMS, F. R.: Sulfanilamide and Heat in Root Canal Therapy. *D. Items Int.*, 62: 315, April 1940.

46. DOBBS, E. C.: Treatment of Traumatic Ulcers. J.A.D.A., 23:260, February 1936.

WAR SERVICE COMMITTEE

FIFTH WAR LOAN DRIVE

To the presidents and secretaries of state societies and the editors of dental journals:

THE American Dental Association has been requested by the Treasury Department to participate actively in the forthcoming Fifth War Loan Drive, beginning June 12, and ending July 8, 1944.

A telegram received by the Committee from the Hon. Henry Morgenthau, Jr., Secretary of the Treasury, follows:

Please convey my sincere appreciation to the members of the American Dental Association for the support they have given the Treasury Department's war bond program. The sale of more than six million dollars worth of bonds during the Fourth War Loan Drive is a fine achievement. I am confident that the members of your organization will respond wholeheartedly in the Fifth War Loan to back the attack and buy more than before.

Inasmuch as all are familiar with the aims and purposes of these drives and the daily newspapers and radio are carrying all of the publicity that seems necessary, this Committee desires only to call it to the attention of the profession through regular channels, with the following observations and suggestions:

1. Owing to the organization perfected in most states in connection with previous drives, it is assumed that each state has its chairman, its committees and most of the other machinery appropriate to function.

2. This Committee believes the same state quotas for dentists as were authorized in the Fourth War Loan Drive will be suitable for the Fifth Drive, which, for the State of Illinois, is $918,600.

3. It has been suggested that it may be possible to secure franking privileges for the mailing of an application blank to members of the profession and that each dental chairman make an effort to secure this privilege from the local Treasury War Finance Committee. For the purposes of compilation, a suggested form, to be filled out by each dentist, is attached, together with the address of the principal suboffice of the Treasury Department War Finance Committee in your state. Dental chairmen are urged to communicate with these officials and work in close harmony and cooperation with them.

4. The War Service Committee and the Treasury Department, for the purposes of this drive, are interested, of course, in the actual purchase of bonds, but the report of the total figures for each state is of paramount importance, so that dentistry may receive its proper credit. In requesting from each dentist a report of his purchase, it is not necessary to ask that he identify his investment, unless he desires to do so. In other words, an unsigned record of his purchase will constitute a sufficient record for the purposes of compilation.

With the amount of additional time given by the Treasury Department to prepare for the Fifth War Loan Drive, it is requested that all state officers begin immediately to urge their committees to make this drive an outstanding success. It is important that each dentist in the state be contacted and presented with a form on which he can indicate the amount in bonds that he proposes to purchase during the Drive. This may be done by personal solicitation, by mail or through the medium of state and local journals; but the main objective to be attained is the prompt return of these individual statements. On the

basis of these returns, state officers will be able to arrive at their totals and communicate them promptly to the War Service Committee. It should be emphasized that whatever purchases are made by him—whether through his dental society, his bank or any other group or organiaztion—the dentist should report to his dental society so that the sum may be applied to the state quota for dentists. This plan will not interfere with the totals or quotas set up by the state and local War Finance Committees, but will simply reflect the amounts subscribed by members of the dental profession.

In spite of the short period of time permitted for preparation for the Fourth War Loan Drive, the great majority of states reporting vastly exceeded their quotas, and, with the dental profession better organized for the forthcoming drive, it is confidently believed that the $12,000,000 national figure will be considerably oversubscribed.

C. WILLARD CAMALIER, *Chairman.*

COUNCIL ON DENTAL HEALTH

VICTORY CORPS PHYSICAL FITNESS DENTAL PROGRAM

THE Victory Corps Physical Fitness Dental Program will soon be completed for the present school year. The time has come when we should attempt to find the answer to a number of important questions. How many high school seniors have received dental corrections during the current school year as compared to previous years? What conditions are chiefly responsible for the success or failure of local Victory Corps Programs? If serious difficulties are encountered, what can health, education and dental organizations do to overcome these handicaps? What devices or aids are needed to obtain better cooperation from all groups involved?

State Victory Corps chairmen have been requested to file a progress report with the A.D.A. Council on Dental Health. It is suggested that, if possible, the reports contain information in answer to the foregoing questions. In addition, it would be of considerable assistance to the A.D.A. Council if state chairmen would give a brief description of programs that have been successfully carried out in rural and urban areas in the various states. For example, a report from the Victory Corps chairman in Tennessee contained the following information:

In Hardeman County, which is a rural county, a county-wide physical examination program for high school students was conducted in 1942, and again in 1943. A Victory Corps program was organized which received excellent cooperation from the local dentists. The findings of the second county-wide examination showed that there was an average of four fillings per white student examined, an average increase of approximately seventy-five filled permanent teeth per hundred students, and the percentage of students with filled permanent teeth increased from 60 to 70.

An example of a program operating in an urban area is the Memphis-Shelby County Program. Dental examinations were made in 1942 and again in 1943. On referral to private dentists or, if eligible, to the dental clinic operated by the health department, 637 received complete care from their private dentist and 692 by the health department dentists.

Similar reports will be published from time to time.

BUREAU OF PUBLIC RELATIONS

DENTISTRY FOR CIVILIANS IN WARTIME

THOMAS L. HAGAN,* D.D.S., New Orleans, La.

DENTISTRY has known for some time that it is failing to fulfil its obligation as a health service. With some variations among individuals, the problem of dental caries is practically universal. Although American dentistry is considered the finest in the world, the fact remains that only a small minority of people have enjoyed the benefits of such service as it is now being administered.[1] Two obstacles stand in the way of extension of dental care: (1) inadequate numbers of dental personnel and (2) prohibitive costs of adequate treatment.

Even in past years, the distribution of dentists has been poor. Concentration of dentists in the metropolitan areas has contributed to failure of rural areas to receive adequate dental service.

In this war period, the shortage of dentists prevents many people from obtaining dental care. When Selective Service and Procurement and Assignment began recruiting dentists for the armed services, the ratio of dentists to population was not considered. Many states met their assigned quotas early, and a considerable number filled the advance year's allotment. Since the armed service training program has been instituted, virtually all students are in the Army or the Navy.[2] For this reason, replacement of dentists who withdraw from active practice is presenting a serious problem. This situation, coupled with the rapid shift of population to war-industry areas, complicates an already confused picture.

The statistical reports released to the public by the Selective Service forcibly reflect the poor dental condition of the youth of today.[3] The fact that 188,000 young men of the first 900,000 rejected were unacceptable because of dental defects made it evident that the specified dental requirements of the armed forces must be modified or the number of men to be inducted reduced by 20 per cent. As a result, the minimum dental qualification of the individual now is an edentulous mouth the condition of which permits the construction of satisfactory dentures.[4]

A number of reasons might be advanced to account for the generalized neglect of dental care: first, the lack of knowledge of how to prevent tooth loss; second, and a very close second, the indifference on the part of the dental profession and health agencies toward planning adequate dental health services. This feeling of indifference is gradually waning, and substantial progress was in evidence when the global war engulfed the country.

With indifference and inadequate methods of control, the economic depression of the early 1930's can be considered at least a partial cause of neglect. This neglect, and the resultant accumulation of dental defects over the years, presents us with a staggering problem.

The rise of the standard of living of many people has caused a proportionate demand for service of all kinds. The service demanded of Dentistry has been for the greater part elective. Despite the huge accumulation of defects, elective dentistry, such as precision replacements, occupies a disproportionate part of the

*Dental surgeon, U. S. Public Health Service.

time of many dentists. It would seem unfair to state that this is the general situation, but demands of private patients are difficult to withstand. The net result of this economic fantasy is that protective and preventive dentistry is waning in quantity.

It is imperative that consideration be given to the correction of this situation, which was created in part by the present war. This consideration might be in the realm of postwar planning, but certainly in these times of increased demand for dental services extension of efforts to save teeth is warranted.

The field of dental research has a relatively small number of competent investigators who are studying dental diseases. To place the prevention of dental caries on a broad basis, it seems desirable that a method of control be established about the operation of which the public is functionally unconscious.

At present, one of the only hopeful means of preventing dental caries for the general population appears to be the addition of sodium fluoride to communal water supplies. The study of fluorine and its relationship to dental health has been unique. The ingestion of fluorides has both good and bad dental results, depending on their concentration. Dean[5] reported that fluorine in a concentration of over 1 part per million, if continuously ingested from birth, caused a hypoplasia of the enamel in a certain percentage of cases. It was noted at the same time that individuals with mottled enamel had a lower caries attack rate. The studies of several investigators[6] have brought two interesting observations to light. The first of these observations is that when, from birth, an individual continuously ingests water having approximately 1 part per million of fluorine, mottled enamel is of no esthetic consequence. The second is that with a 1 part per million concentration of fluorine in the water supply, the incidence of caries drops markedly.

Nutrition has gained increased recognition by public health agencies in recent years. Lunchroom supervision in schools and in industries is considered imperative for the general health. Marked improvement in efficiency, because of adequate diet, is thought to be due to this supervision. Though an adequate diet is advantageous from the standpoint of general health, it apparently has no effect in the reduction of dental caries.

Studies in nutrition and its relationship to dental disease are in process and are leading to varied conclusions. There are two schools of thought, the "optimum" diet on the one hand, and the sugar-and-starch-free diet on the other. Both schools are given some credit for the reduction of the incidence of caries. It is assumed, in substantially all nutritional studies, that human beings are comparable in their susceptibility to caries. On this basis, nutrition that would be adequate for one would be applicable to all. However, we are faced with a multitude of racial, familial, hereditary and climatic factors, which introduce important variables. From these studies, however, it appears that the reduction of carbohydrate intake is at least one way of reducing caries incidence and one most nearly approaches the solution to the problem. On the other hand, critical analysis shows that the so-called optimum diet is low in sugar and starch, and, therefore, sugar and starch reduction may be the common ground for controlling dental caries, and that these two schools of thought are in agreement in fundamentals, if not in terminology.[7]

There is evidence of an increase in the incidence of dental caries among susceptible individuals who are on a high sugar diet.[8] The studies of Collins, Jensen and Becks[7] strongly suggest that each individual may have a carbohydrate limit within which he continues free of dental caries and which, when exceeded, exposes him to the ravages of

this increasingly prevalent disease. It appears, then, that these individuals should make an effort to eliminate excessive amounts of carbohydrates from their diet. Certainly in these times of rising food costs, it is sound advice to encourage persons to spend money for protective nutritious foods in place of a diet excessively high in sugars, such as candies, pastries and soft drinks.

Any thought of extension of public health dentistry must consider the present curriculum in undergraduate dental study. Of necessity, extension to include the study of the relationship between dentistry and public health must be included. Courses in dentistry for children are needed in many schools. Serious thought has been given these deficiencies by dental educators in the past few years, however, and it is hoped that there will be rapid educational expansion in the near future.

Despite the fact that there are strong convictions among some dental research workers that the application of sodium fluoride and low carbohydrate diets are adequate to control dental caries, the actual mechanism of dental caries progression remains a moot question. However, the need for continuation of dental research and the expansion of dental facilities is clear enough. Mountin[9] states that investigation of causes of upper respiratory infections, mental disease and dental disease must be the main objective of public health workers if morbidity is to be reduced.

For the present emergency, a few steps can be taken voluntarily by private dentists that will in no way interfere with individual methods of practice. The first step would be to devote more time to the protective phases of dentistry and less to the elective phases; to return to the practice of saving as many teeth as possible, and to postpone replacement of teeth where such replacement is of small value. The second step, particularly in congested areas with grossly inadequate dental services available, would be to arrange a schedule of "duty days," under which one or more dentists in turn would allocate one day to emergency calls. Participating dentists, local health officials, industrial medical personnel and interested local groups could serve as cooperating agencies. The establishment of adequate ethical methods of publicizing the plan would acquaint the community with its operation and would result in better control of acute dental trouble. The third suggested step would be to make every effort to continue and expand all programs of dentistry for children. It is with children, and children alone, that present-day dental practice can hope to show the best results in the saving of teeth.

With the introduction of dentistry for children and public health dentistry in the curriculum for undergraduates, it seems logical to conclude that provisions should be made for better instruction for graduate dentists. Seminars, refresher courses and other means of postgraduate instruction should be planned and developed. The training might well comprise the academic subject matter given in the accredited schools. The objective is the same: more adequate dental care for lower age groups.

The financing of such studies may appear beyond the resources considered available. As the whole plan of thought is in effect a public health measure, some subsidization by the health department should be an assumed obligation. This is not a new proposal: the effectiveness of such programs has been proved in several states. Experience has taught us that this instruction must be continuous in operation, since spasmodic attempts will result in a waste of funds.

Mention has been made of the responsibility that the health department feels for reducing the incidence of dental disease. Of the monies budgeted for cooperative health work in the United States, at the state level only, 0.6 per

cent was budgeted for dental programs in 1941 and 0.7 per cent in 1942.[10] As dental disease affects 85 per cent of the population and directly contributes to the morbidity rate, it seems that a larger allocation of funds is justified.

Since the institution of state merit systems, the status of the dentist in the health department has improved. There exists a need for keeping the educational and experience requirements of the dentist on a high plane, and it is imperative that salary ranges be commensurate with qualifications and duties, if dental programs are to progress in the public health organization.

Dental programs enter into a number of sections of the health department: the Maternal and Child Health, Industrial Hygiene, Venereal Disease, Nutrition and Health Education. More complete correlation of dental activities would be possible if a divisional status were established within the department. Recently, the administrative organizations of the Army, Navy and Public Health Service were realined in a similar manner.

To conclude, it appears that, during this time of chaos, the following ideas may well contribute to public health by providing adequate dental service to more persons: (1) the reduction in quantity of elective dentistry; (2) the establishment of emergency schedules in crowded areas, and (3) the continuation of organized programs.

For future planning, it is suggested that more adequate courses in children's dentistry, public health and education be offered in dental schools; that postgraduate courses in these subjects be established for private practitioners and be subsidized if necessary, and the administrative organization of the health department provide for the integration of dentistry in health activities.

BIBLIOGRAPHY

1. BUNTING, R. W.: Planning Postwar Dentistry. J.A.D.A., 30:1659-1665, November 1, 1943.

2. MURRAY, J. E.: Extension of Remarks: Address of Sen. Claude Pepper before Massachusetts Dental Society, January 26, 1944. *Cong. Rec. App.*, 90:A705-A707, February 9, 1944.

3. ROWNTREE, L. G.; MCGILL, K. H., and FOLK, O. H.: Health of Selective Service Registrants. *J.A.M.A.*, 118:1223-1227, April 4, 1942.

4. *Army D. Bull.*, M R 1-9, revised April 1942.

5. DEAN, H. T.: Endemic Fluorosis and Its Relation to Dental Caries. *Pub. Health Rep.*, 53:1443-1452, August 19, 1938.

6. DEAN, H. T.; ARNOLD, F. A., and ELVOVE, ELIAS: Domestic Water and Dental Caries. V. Additional Studies of Relation of Fluoride Domestic Waters to Dental Caries Experience in 4,425 White Children, Ages 12-14 Years, of 13 Cities in 4 States. *Pub. Health Rep.*, 57:1155-1179, August 7, 1942.

7. COLLINS, R. O.; JENSEN, A. L., and BECKS, HERMANN: Study of Caries-Free Individuals: II. Is Optimum Diet or Reduced Carbohydrate Intake Required to Arrest Dental Caries? J.A.D.A., 29:1169-1178, July 1, 1942.

8. JAY, PHILIP: Bacteriology and Immunology of Dental Caries; in Dental Science and Dental Art. Edited by Samuel Gordon. Philadelphia: Lea & Febiger, 1938, pp. 348-372.

9. MOUNTIN, J. W.: Evolving Pattern of Tomorrow's Health. I. Prerequisites to Improved Public Health. *Am. J. Pub. Health*, 33:1401-1407, December 1943.

10. PELTON, W. J.: Federal Aid in Public Health Dentistry. J.A.D.A., 30:570-576, April 1, 1943.

Pere Marquette Building.

OBITUARY

STANLEY W. CLARK

(1887-1944)

STANLEY W. CLARK, D.D.S., M.S.D., LL.B., professor of materia medica and therapeutics and of anesthesia at Northwestern University Dental School, was born in Chicago in 1887 and died at his home there, April 1, 1944.

Dr. Clark was an active teacher on the faculty for thirty-one years, having held this position from the time of his graduation, in 1916. He made significant contributions to the profession through his research, especially in local anesthesia and in the practical application of drugs in dental practice, and directed the research studies of many of his associates and graduate students. He served for many years as a member of the Graduate Committee of the Northwestern University Dental School, and at the time of his death was completing his third year of service on the General Faculty Committee of the university. He himself was a continuous student. He possessed a dynamic personality and was a helpful guide and counselor to students, as well as an enthusiastic teacher.

Dr. Clark served on the staff of Wesley Memorial Hospital. He was a member of Omicron Kappa Upsilon, Sigma Xi and Delta Sigma Delta fraternities, a member of the American Dental Association and of the International Association for Dental Research and a Fellow of the American College of Dentists.

Dr. Clark continued his interest in military affairs after serving with distinction with Base Hospital 12 in World War I, and at the time of his death held the rank of colonel in the Reserves. He had been president of the Medical Chapter of the Cook County Reserve Officers Association, and first vice commander of the Chicago Chapter of the Military Order of the World War. His devotion to duty as a Reserve Officer contributed much to maintaining interest in military preparedness during the years when little thought was given to the subject.

STANLEY W. CLARK
1887-1944

Dr. Clark was buried with military honors in Oak Woods Cemetery, Chicago. He is survived by his widow, Lucille M. Clark, and two brothers.

CHARLES W. FREEMAN.

DEATHS

ATAMIAN, ARMENAG, San Francisco, Calif.; died March 27; aged 72.

BAKER, JOHN ULYSSES, Elkins, W. Va.; Baltimore College of Dental Surgery, 1906; died March 23; aged 65.

BALDWIN, WILLIAM PITT, New Haven, Conn.; died February 5.

BAUCUM, JESSE, Cloverport, Ky.; University of Louisville, School of Dentistry, 1912; died March 31; aged 62.

BEAN, A. O., Rogers Park, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1894; died March 26; aged 70.

BRIGGS, E. FRED, Bangor, Maine; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1903; died March 31; aged 69.

BROWN, CHARLES D., Melrose, Mass.; Tufts College Dental School, 1904; died April 9; aged 65.

BYRNE, SYLVESTER, Philadelphia, Pa.; Pennsylvania College of Dental Surgery, 1892; died April 14; aged 78.

CASSILL, OWEN E., Chicago, Ill.; Northwestern University Dental School; 1905; died April 4; aged 64.

CHARRON, WILBUR A., Worcester, Mass.; University of Maryland, School of Dentistry and Baltimore College of Dental Surgery, 1909; died March 25; aged 54.

CLARK, JOHN F., North Adams, Mass.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania; died March 29; aged 66.

CLARK, STANLEY WILLIAM, Chicago, Ill.; Northwestern University Dental School, 1916; died April 1; aged 57.

COLTER, CHARLES W., Detroit, Mich.; Detroit College of Medicine, Department of Dental Surgery, 1907; died April 6; aged 61.

COROSO, JOSEPH T., SR., Hartford, Conn.; Baltimore College of Dental Surgery, 1922; died March 23.

CRANNEY, WILFORD LORON, Kemmerer, Wyo.; School of Dentistry, University of Denver; died March 27; aged 47.

CRAWFORD, E. H., Santa Rosa, Calif.; died March 30.

DIXON, RALPH, Whitewater, Wis.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1904; died April 4; aged 63.

DRISCOLL, JOHN J., Palo Alto, Calif.; College of Physicians and Surgeons of San Francisco, a School of Dentistry, 1907; died March 23.

DUFFENDACK, J. F., Springfield, Mo.; Kansas City-Western Dental College, 1924; died March 28; aged 54.

ELSLAGER, JOHN E., Decatur, Ill.; died March 22; aged 84.

FELDMAN, ISADORE A., San Francisco, Calif.; College of Physicians and Surgeons of San Francisco, A School of Dentistry, 1919; died March 17; aged 59.

FERDINAND, SAMUEL S., Peoria, Ill.; Northwestern University Dental School, 1917; died April 11; aged 48.

FLAYDERMAN, EDWARD, Malden, Mass.; died April 14; aged 45.

GERMAN, G. FRANKLIN, Erie, Pa.; Baltimore College of Dental Surgery, 1904; died March 11; aged 67.

GREEN, CHARLES D., Ottawa, Ill.; Royal College of Dental Surgeons of Ontario-School of Dentistry, Toronto, 1891; died April 9; aged 74.

GULLICKSON, FRANCIS L., West Salem, Wis.; Marquette University, School of Dentistry, 1912; died April 15; aged 54.

GUNN, CHARLES L., Gadsden, Ala.; Vanderbilt University, School of Dentistry, 1900; died March 29.

HAMILTON, DILLON, El Dorado, Kan.; Northwestern University Dental School, 1903; died March 19; aged 70.

HANNELL, J. M., Hoopeston, Ill.; died April 14; aged 62.

HANNEMAN, RUDOLPH W., Condon, Ore.; University of Minnesota, College of Dentistry, 1910; died March 19.

HEER, FRANK S., Boise, Idaho; Chicago College of Dental Surgery, Dental Department of Loyola University; died April 6; aged 70.

HORN, WILLIAM WALLACE, Logansport, Ind.; Northwestern University Dental School, 1914; died April 12.

HOWSER, UPTON S., Washington, D. C.; George Washington University, Dental Department, 1906; died March 20; aged 64.

JOHNSON, WALTER H., Winfield, Iowa; State

University of Iowa, College of Dentistry, 1920; died April 10; aged 51.

KENDRICK, H. H., Montgomery, Ala.; Atlanta-Southern Dental College, 1901; died March 25; aged 64.

KIERNAN, CECELIA R., Brooklyn, N. Y.; Tufts College Dental School, 1911; died April 11; aged 54.

KRUSZYNSKI, PAUL P., South Bend, Ind.; Indiana University School of Dentistry, 1923; died March 31; aged 51.

KUPPERSTEIN, H. WILLIAM, Hartford, Conn.; Harvard University Dental School, 1915; died April 18; aged 50.

LEAKE, WALTER J., Lockport, N. Y.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1889; died April 5; aged 80.

MCDANIEL, FLOYD L., Houston, Texas; Texas Dental College; died February 15, at Anzio Beachhead, Italy. Dr. McDaniel was a captain in the Army Dental Corps.

MACDONALD, PHILLIP F., La Grange, Ill.; Northwestern University Dental School, 1905; died April 3; aged 65.

MAPES, LLOYD A., Cleveland, Ohio; Western Reserve University, School of Dentistry, 1903; died April 17; aged 64.

MARTIN, JOHN E., Legion, Texas (formerly of Peru, Ind.); died April 2; aged 52.

METHVEN, HUSTON F., Chicago, Ill.; Northwestern University Dental School, 1900; died April 1; aged 73.

MORAN, AUGUSTINE JAMES, Chicopee Falls, Mass.; Tufts College Dental School, 1919; died April 10; aged 49.

MOYER, W. H. K., Little Falls, Minn.; Western Reserve University, School of Dentistry, 1897; died April 5.

MYERS, GEORGE W., Lykens, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1900; died March 24; aged 64.

NEECE, WILLIAM A., Macomb, Ill.; Baltimore College of Dental Surgery, 1887; died March 30; aged 82.

PARDOE, JONATHAN B., Bound Brook, N. J.; Pennsylvania College of Dental Surgery, 1896; died April 12; aged 71.

RALPH, H. B., Commerce, Okla.; died March 30; aged 56.

SCOTT, D. C., San Benito, Texas; died February 15; aged 91.

SHAW, ROY G., Indianapolis, Ind.; Indiana University School of Dentistry, 1904; died March 29; aged 63.

STAMPER, WARREN L., Indianapolis, Ind.; Indiana University School of Dentistry, 1910; died April 2; aged 73.

STONE, CHARLES P., Saginaw, Mich.; University of Michigan, College of Dental Surgery, 1891; died March 29; aged 73.

SWEENEY, J. T., Mitchell, S. D.; Northwestern University Dental School, 1901; died April 15.

THIELE, OTTO HENRY, Pierce City, Mo.; Washington University School of Dentistry, 1891; died February 20; aged 75.

THOMPSON, D. P., Seneca, S. C.; Baltimore College of Dental Surgery, 1900; died March 17.

VAN SICKLE, F. E., Whitehall, Wis.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1916; died April 11; aged 55.

VAUGHAN, HERBERT E., Ogdensburg, N. Y.; Temple University School of Dentistry, 1890; died April 11; aged 75.

VIGNES, C. VICTOR, New Orleans, La.; Louisville College of Dentistry, 1892; died April 1; aged 76.

WALLACE, FRANCIS H., Harrison, Nebr.; University of Buffalo, School of Dentistry, 1898; died in March; aged 68.

WILDE, OTTO E., Tacoma, Wash.; died March 25; aged 86.

WURSTER, GEORGE P., Clinton, Iowa; University of Michigan, College of Dental Surgery, 1894; died March 27; aged 72.

NEWS

COMMISSIONS FOR WOMAN DENTISTS IN THE WAVES

THE Navy has just announced that woman dentists may now apply for commissions as dentists in the WAVES. The qualifications are the same as for men with the exception that duty will be within the Continental Limits. The applicant must not be married to an officer in the Navy and must not have children under 18 years. Further information can be obtained at any office of Naval Officer Procurement or the Bureau of Naval Personnel, Washington, D. C.

CHICAGO DENTAL SOCIETY OFFICERS FOR 1944-1945

AT the regular meeting of the Chicago Dental Society held April 18, the following candidates were elected to office for the year June 1, 1944 to May 31, 1945: Joseph B. Zielinski, president-elect; Robert I. Humphrey, vice-president; Harry A. Hartley, secretary; James H. Keith, treasurer. Harold W. Oppice, named president-elect a year ago, will succeed to the presidency June 1. These officers were inducted into office at the regular meeting of the society, May 18.

HONORARY MEMBERSHIP IN NEW ORLEANS DENTAL ASSOCIATION TO CAPTAIN RAULT

A RESOLUTION was endorsed by five members of the New Orleans Dental Association and approved by the board of governors, March 1, conferring honorary membership in the association on Capt. Clemens V. Rault, of Louisiana, a graduate of Loyola University of the South, and a member of the Dental Corps of the United States Navy since 1919, for fulfilling "many assignments at home, afloat and abroad in a superlative manner," and in recognition of his record as "a teacher, scholar and leader in his profession."

ACKNOWLEDGMENT

The following acknowledgment was inadvertently omitted from the paper by J. S. Restarski, "Dental Anesthesia Induced by Local Refrigeration," in the May issue of THE JOURNAL: The author wishes to express his appreciation for the assistance rendered by Lieut. I. Gersh, H-V(S), USNR, in preparation of the material for histologic study and interpretation.

CORRESPONDENCE

"THE FIRST VALID D.D.S. DEGREES"

To the Editor:

We wish to thank Dr. Bernard W. Weinberger, whose published studies we have followed with interest, for calling attention to his article in the November 1937 issue of the *Bulletin of the New York State Dental Society*. In preparing the groundwork for our article "The First Valid D.D.S. Degrees," for the November 1, 1943 issue of THE JOURNAL, we of necessity ploughed to a certain extent in the same field which Dr. Weinberger had been working in, without being aware of his recent activity there. Our unawareness was due to the lack of reference in both the Index of Dental Literature and the Index Medicus to his article, either by subject or by author. Yet if we had known of it, our article would still have been written, though in modified form and with full acknowledgement of the priority of his studies.

We were especially interested in Dr. Weinberger's clarification of the attitude and action of the New York State Legislature relative to the petition of the American Society of Dental Surgeons for the degree-granting privilege. Another point that he throws light upon is the confusion of the Philadelphia College of Dentistry with the Philadelphia Dental College. The similarity of the two names is, of course, responsible for this, and, even with the greatest of care, this error seems fated to happen, as reference to Dr. Weinberger's own letter in the January 1944 issue of THE JOURNAL, page 140, will show. In our own case, we were quoting from Dr. J. Ben Robinson, as our bibliography indicates. It is a perfect demonstration of why the dental historian should check every statement, no matter how seemingly reliable the authority.

In commenting upon the early use of the D.D.S. degree, we have not attempted to write its history. What we have done is to focus attention upon the evidence that its use without the sanction of charter was invalid, and known and admitted to be so by the leaders of the profession at that time.

LOREN B. TABER, B.S., D.D.S.
MARY B. LINS, A.B.

"UNFAVORABLE REACTIONS OF MOUTH TISSUES TO MATERIALS USED IN DENTURE CONSTRUCTION"

To the Editor:

IN the November 1, 1943 issue of THE JOURNAL, Dr. John A. Higgins cites three cases in which dentures caused irritation to the membrane of the mouth. He reports that all cases cleared up when he substituted a vulcanite denture for the one being worn. This would imply that the first denture was not vulcanite, but possibly acrylic.

His position that "further investigation and research on all denture materials containing active chemical ingredients should receive the support of the dental profession" is well taken. In contrast with his experience, I should like to report a case:

A woman about 40 years old who had her own upper teeth wore, for about two years, and with increasing discomfort, a full lower vulcanite denture that I had made. After she had had the denture in her mouth for a short time, she would develop a dermatitis of the face, hands, etc. Some time after the denture was removed, the dermatitis would clear up. Tests revealed that anything which she ate containing sulfur would cause dermatitis. I "jumped" the denture and made one of acrylic. This she has now worn for three months with no discomfort and no recurrence of the dermatitis. She has to avoid eating eggs, peas and anything that contains sulfur. I am convinced that this is a simple case of allergy and that sulfur is the offending substance.

C. W. MILLER,
New Ulm, Minn.

CURRENT LITERATURE

Journal of Oral Surgery
January 1944

Subjects marked with an asterisk are reviewed below.

*Prevention and Treatment of Acute Infections Associated with the Removal of Teeth. Howard C. Miller, D.D.S., Chicago, Ill.—1.

*Cavernous Sinus Thrombophlebitis: Report of a Case of Undiagnosed, Untreated Fracture of the Mandible. Morven Curran, D.D.S, Kansas City, Mo.—7.

*Nerve Injuries Incident to Dental Surgery. Martin L. DeBats, D.D.S., and Walter H. Phillips, D.D.S., M.S., Detroit, Mich.—13.

*Infections in the Pterygopalatine Fossa. G. Thaddeus Gregory, D.D.S., Indianapolis, Ind.—19.

*Nephritis Following Sulfonamide Therapy in Cellulitis of the Jaw: Report of Case. William J. Dalton, M.D., Cincinnati, Ohio.—21.

*A Removable Plaster Headcap. Don E. Woodard, D.D.S., M.S.D., Kansas City, Mo.—23.

*The Use of Stents in Skin Grafting in the Mouth. Oscar Edward Beder, B.S., D.D.S., New York, N. Y.—32.

A Quarter-Century of Achievements of the American Society of Oral Surgeons and Exodontists. Harry Bear, D.D.S., Richmond, Va.—39.

*Dentigerous Cysts. Guillermo A. Ries Centeno, Buenos Aires, Argentina.—44.

*Bilateral Fracture of the Condyles of an Edentulous Mandible with Marked Retrusion Displacement: Report of Case. Samuel G. Balkin, M.D., D.D.S., and Carl W. Waldron, M.D., D.D.S., Minneapolis, Minn.—58.

*Prognathism—Open Bite Deformity: Report of Case. Reed O. Dingman, A.B., D.D.S., M.S., M.D., Ann Arbor, Mich.—64.

*Bilateral Ankylosis of the Temporomandibular Joints with Retrusion Deformity: Report of Case. Reed O. Dingman, A.B., D.D.S., M.S., M.D., Ann Arbor, Mich.—71.

*Epithelioid Giant Cell Tumor of the Tongue, Locally Malignant: Report of Case. Reed O. Dingman, A.B., D.D.S., M.S., M.D., Ann Arbor, Mich.—77.

*Penicillin in Cellulitis of the Face: Report of Case. George W. Christiansen, A.B., D.D.S., M.S., Bethesda, Md.—83.

Prevention and Treatment of Acute Infections Associated with the Removal of Teeth

By Howard C. Miller

When the question as to whether to extract a tooth or otherwise surgically intervene in the presence of acute infection arises, experience and surgical judgment are essential in arriving at the decision. Diagnosis can be assisted by an adequate history and roentgenograms. Treatment should consist of controlling the inflammatory process and the establishment of drainage. In many cases, extraction of the tooth must be postponed until subsidence of the acute process. Usually, several days should elapse after onset, in order to permit localization, before surgical measures are taken. Conservatism is the rule. The presence of pain cannot be the only indication for extraction. Acute pericoronitis about third molars and Vincent's infection should be controlled prior to operative interference. Adequate drainage does not occur through tooth sockets when bone and periosteum are involved. Infiltration anesthesia must be avoided in acute infections. Local and general sulfonamide therapy are of value in treatment. Penicillin seems to promise much in the treatment of infections of dental origin. Postoperative care and observation are essential.

Cavernous Sinus Thrombophlebitis: Report of a Case of Undiagnosed, Untreated Fracture of the Mandible

By Morven Curran

In handling a case of cavernous sinus thrombophlebitis, a knowledge of anatomy is essential. An emissary vein from the sinus leading to the pterygoid venous plexus is a factor in thrombotic extension, as is the ophthalmic vein. Lack of valves also is important. Inflammation of the walls of the

sinus produces the thrombus. Acute inflammation about the upper lips, nose, eyelids, scalp and teeth is a potential source of cavernous sinus thrombophlebitis. Premature surgical procedures in these areas are to be avoided. A diagnosis based on the classical signs of septic temperature, protrusion of the eyeball, ocular edema and paralysis of eye muscles may be too late. Any unilateral orbital congestion, with a high temperature, should indicate the need for ophthalmologic consultation, as dilatation of the retinal veins is the most important early finding in the disease. The cause of the cavernous sinus thrombophlebitis in the case reported was thought to be an undiagnosed mandibular fracture. Roentgenograms were not obtained until postmortem, when the fracture was revealed.

Infections in the Infratemporal Fossa

By G. THADDEUS GREGORY

GREGORY invites attention to a syndrome produced by infections in the infratemporal fossa following tuberosity injections. The universal signs that he encountered were trismus, severe pain, usually normal or slightly above normal temperature, swelling above the zygomatic arch on the fifth to tenth days and occasional lower lip or tongue numbness. Pus accumulates in a small confined anatomic space, which he describes. Treatment is by incision in the mucobuccal fold near the upper third molar, and entrance is made to the pus-containing cavity by means of a curved hemostat moved along close to the bone. Prevention lies in adherence to the rules of aseptic surgery and sound judgment.

Nerve Injuries Incident to Dental Surgery

By MARTIN L. DEBATS AND WALTER H. PHILLIPS

CONSIDERATION is given to nerve injuries incident to oral anesthesia and surgical measures. The nerves involved most frequently are the inferior alveolar, lingual, infra-orbital and facial. The inferior alveolar injury resulting in prolonged anesthesia of the lip and chin usually occurs during removal of an unerupted lower third molar that penetrates the mandibular canal. Accurate preoperative roentgenograms are essential. Embarrassment can be avoided if the patient is forewarned about the possibility of numbness. Removal of bone overlying a tooth that impinges on the mandibular canal sometimes allows the tooth to erupt away from the nerve trunk. Extraction can be completed at a later date. Pressure injuries to the inferior alveolar nerve in the canal cause anesthesia lasting for less than six months, while cutting of the fibers results in numbness of greater duration. The lingual nerve is occasionally injured during operations medially from the lower third molar. Great caution should be exercised in working in this area. Damage to the mental nerve occurs in operations near the lower bicuspids. Severance of the inferior alveolar nerve at this point results in lip anesthesia. Infra-orbital and facial nerve complications are rare. Temporary facial paralysis occurs from the erratic insertion of mandibular block needles into the parotid gland.

Nephritis Following Sulfonamide Therapy in Cellulitis of the Jaw: Report of Case

By WILLIAM J. DALTON

SULFONAMIDE therapy is not without its hazards. This report of a case of nephritis emphasizes the need for adequate laboratory procedures when sulfonamides are administered and suggests the use of an alkali with the drug.

A Removable Plaster Headcap

By DON E. WOODARD

A removable plaster headcap is divided at the occiput, where it curves low over the protuberance. Buckles and elastic belting are utilized to reattach the parts.

Dentigerous Cysts

By GUILLERMO A. RIES CENTENO

AFTER a critical discussion of many theories regarding the origin of dentigerous cysts, the author comes to the conclusion that "dentigerous cysts are due to mechanical difficulties encountered during eruption, and, which act upon the pericoronal sac." He feels that increase in quantity and tension of the fluid from the epithelium of the enamel organ governs the growth of the tumor. The crown of the tooth is always within the cyst. In Centeno's experience, dentigerous cysts occur

more frequently in the mandible than in the maxilla; they exist more often in the young, and they are outnumbered by paradental cysts in the ratio of 1 to 12. The growth of these cysts is along the lines of least resistance: buccally in the upper jaw, except in the cuspid region, where it progresses palatally, upward into the ramus in the lower third molar area and toward both cortical plates elsewhere in the mandible. Diagnosis is largely dependent on roentgenology, but pain and swelling are important considerations. Treatment usually is by complete surgical enucleation, although conservative removal of the follicle only is sometimes indicated.

Use of Stents in Skin Grafting in the Mouth

By OSCAR EDWARD BEDER

IN use of stents or molds for the retention of skin grafts, the chief application about the mouth involves the creation of epithelially lined sulci that can accommodate prosthetic appliances. Acrylic or rubber stents are better than those of modeling compound. The denser materials are more efficient where no "give" is desired, and flexible rubber or latex is preferable in cases requiring compression. Immobility of the mold and good fit are prime factors in the success of a graft.

Prognathism—Open Bite Deformity: Report of Case

By REED O. DINGMAN

IN mandibular prognathism, the psychologic attitude of the patient, which usually is one of inferiority, is the chief indication for surgical interference. It is considered only when orthodontia cannot adequately correct the deformity. The patient in the case reported possessed, in the main, anterior teeth only. Therefore, an acrylic splint was constructed to retain the mandible in position after resection of the rami. This was held to the lower jaw by circumferential wires. A lug wire arch was attached to the maxillary anterior teeth. The approach to the rami was by the open method. A pathfinder needle was inserted from posterior to anterior, medially from the ascending rami, above the level of the mandibular foramen, on both sides. A Gigli saw was then placed in position and the bone was cut through, the equivalent of two horizontal fractures of the ascending rami resulting. The mandibular body was then moved backward and the jaws were placed in occlusion in the splint. The upper and lower bone fragments were fastened together by direct wiring and the upper teeth were wired to the lower. Closure of the wounds followed. The improvement in the appearance of the patient was striking.

Bilateral Fracture of the Condyles of an Edentulous Mandible with Marked Retrusion Displacement: Report of Case

By SAMUEL G. BALKIN and CARL W. WALDRON

IN a case of impacted bilateral condyle fractures of an edentulous mandible, under general anesthesia the condyle necks were disengaged from their wedged-in positions and the alveolar ridges were placed in a Gunning type splint prepared from the patient's dentures. Next, a Kirschner wire was transfixed in a lateral direction through the symphysis and this, in turn, was attached to the front of a headcap by rubber traction.

Bilateral Ankylosis of the Temporomandibular Joints with Retrusion Deformity: Report of Case

By REED O. DINGMAN

BILATERAL arthroplasty and a cartilage implant over the symphysis were employed to correct ankylosis and a retrusion deformity in the case presented. On one side, a temporal fascial implant was interposed. No difference in function between the two sides was noted postoperatively. Generous portions of bone were removed from the condyle areas in both instances. The costal cartilage used to build up the chin came from the patient's mother. Ordinarily, cartilage obtained from necropsies is employed.

Epithelioid Giant Cell Tumor of the Tongue, Locally Malignant: Report of Case

By REED O. DINGMAN

IN the case of a rather unusual epithelioid giant cell tumor of the tongue, a small pedunculated tumor was first noted on the side of the tongue by the patient, a man aged 35. He was advised to do nothing about it except to

keep it under observation. The stalk later disappeared, and the mass, carcinoma-like in appearance, occupied the middle third of the lateral border and was infiltrative. The cervical nodes were not enlarged. A preoperative biopsy indicated benignity. Nevertheless, the mass was widely excised by electrocautery. The lingual artery was recovered and tied during operation. The pathologic diagnosis was epithelioid giant-cell tumor, locally malignant. One year later, there had been no recurrence. This case "illustrates the occasional necessity of radical treatment for a tumor which clinically appears to be malignant, even though reported as a benign tumor by the pathologist."

Penicillin in Cellulitis of the Face: Report of Case

By GEORGE W. CHRISTIANSEN

THE patient, a woman aged 21, had two maxillary third molars removed. A rather stormy and septic period followed. Sulfa therapy was ineffectual, but a rapidly downhill course was dramatically arrested when penicillin was introduced.

An Eruptive Fever Involving the Mouth and Eyes (Stevens-Johnson's Disease)

R. C. MURPHY, JR.

STEVENS and Johnson, in 1922, reported a new eruptive fever associated with stomatitis and ophthalmia. Similar cases have since been reported. This is an acute systemic reaction sometimes fulminating, with fever and prostration. There is an erythematous generalized skin rash with severe stomatitis, followed by sloughing. Usually, the conjunctivae are involved. There is resolution of the skin lesions in about three weeks. A case illustrating the most constant clinical findings is reported. Little or nothing is known of the fundamental nature of the disease or of its etiology.—*New England J. Med.*, 230:69, January 20, 1944.

S. J. FANALE.

Penicillin in the Treatment of Cellulitis of the Mouth

W. E. HERRELL and D. R. NICHOLS

PENICILLIN therapy was instituted in six cases of rather extensive mouth cellulitis, five of which had been resistant to sulfonamide therapy. Two cases were complicated by bacteremia. No toxic reactions were evidenced and the response was considered almost dramatic. The penicillin was administered by the continuous intravenous drip method and from 32,000 to 40,000 Oxford units in two liters of physiologic sodium chloride solution was the daily dose. Marked clinical improvement was apparent, and those patients experiencing difficult deglutition were rid of this symptom in from forty-eight to seventy-two hours. The first sign of improvement was generally a decrease in toxemia. Two case reports are given. It is believed that penicillin may shorten the period of convalescence and reduce the danger of complications associated with cellulitis of the mouth.—*Am. J. Orthodontics*, 30:1, January 1944.

S. J. FANALE.

Bone Grafts to the Mandible

G. B. NEW and J. B. ERICH

WAR injuries of the mandible will undoubtedly increase the use of bone grafting in maxillofacial surgery. Painstaking aseptic surgical procedures and the construction of appliances to immobilize the bony fragments during healing are important. Research in bone grafting indicates that all or at least most of the graft undergoes gradual death, being replaced by new bone. The rapidity of this process varies inversely as the density of the transplant. Failures are generally due to infection. Latent infection is a constant potential danger and, in cases where bone was lost because of osteomyelitis, it is suggested that an asymptomatic period of six to nine months elapses before bone graft implantation is attempted. Shortly after the original injury, an appliance should be constructed to maintain the mandibular fragments in normal position and occlusion during the preoperative period. All teeth that may interfere with the application of a bone graft must be removed at least three months before transplantation. External fixation is contraindicated. Thorough immobilization must be assured and the necessary appliance should be properly placed the day before the operation. Various types of fixation appliances are described. The authors believe that bone obtained from the crest of the ilium or rib is preferable, both

containing cancellous bone with a moderately thin layer of cortical bone. An incision is made at least 2 cm. below the lower mandibular border and the fragments are exposed by blunt dissection. Perforation through the oral mucosa should be particularly guarded against. After the buccal and lingual bone surfaces are exposed, the free ends are ground down until bleeding occurs. After the transplant is shaped, holes are drilled through the ends of the fragments and the bone graft, after which the graft is tied to the fragments with heavy dermal catgut. Powdered sulfathiazole is sprinkled in the wound.—*Am. J. Surg.*, 63:153, February 1944.

S. J. FANALE.

A Characteristic Dental Finding in Acrosclerosis and Diffuse Scleroderma

E. C. STAFNE and L. T. AUSTIN

THE roentgenographic finding reported which is supposedly characteristic of patients suffering from acrosclerosis and diffuse scleroderma is a definite increase in the width of the periodontal space. In four cases, a tentative diagnosis of acrosclerosis or scleroderma was made from dental roentgenograms, a diagnosis that was later confirmed. Nine of 127 cases of these diseases showed this roengenographic finding. All of the teeth may not be affected and there is a greater involvement of posterior teeth. The increase in width is uniform. The appearance on the x-ray film is somewhat similar to that of teeth which are being rapidly extruded from the alveolus although there is no change in occlusion. The teeth are surprisingly firm in their sockets. Some patients may be unable to open their mouths. The roots are covered by an excessive amount of soft tissue, which is firmly attached to them.—*Am. J. Orthodontics*, 30:25, January 1944.

S. J. FANALE.

Ceepryn: Clinical and Bacteriologic Studies

By G. B. KRAMER and S. H. SEDWITZ

THE authors report on the use of ceepryn tincture 1:200 over a period of three years (18,000 cases). Studies show ceepryn (cetylpyridinium chloride) to be a very effective and non-irritating cutaneous disinfectant for sterilization of the operative field. A 1:1,000 aqueous solution used as an irrigant or wet dressing is of value because of its germicidal action and detergence. The drug contains no phenols or heavy metals, which in some cases are irritating.—*Am. J. Surg.*, 63:240, February 1944.

S. J. FANALE.

Fluorine and Dental Health—Postwar Implications

By JOHN W. KNUTSON and S. C. ARMSTRONG

APPLICATIONS of a 2 per cent sodium fluoride solution to teeth in the upper and lower left quadrants of the mouth indicated a 40 per cent reduction in the incidence of dental caries of 289 children treated. Although 1 part per million of fluoride added to water supplies seems to be more effective in preventing dental caries (50-65 per cent reduction), topical applications may afford a useful adjunct or substitute method, particularly for present populations and that third of the population using private wells or other sources of supply.—*Am. J. Pub. Health*, 34:239, March 1944.

PAUL H. KEYES.

Dental Needs of Massachusetts Children Today

By P. E. BOYLE *et al.*

SINCE the dental caries problem is a more serious problem in Massachusetts than in other sections of the country, and since early detection and treatment require a highly trained personnel and is expensive, more efficient use of this personnel is suggested. Emphasis should be placed upon attaining maximum productivity and efficiency in operative procedures. Dental schools might train students, as well as dental assistants and laboratory technicians, in time-saving methods of operating. Public health dental service could be promoted, and the appointment of an advisory council to the dental unit of the Massachusetts Department of Public Health is recommended. Although the treatment of dental disease is the province of the dentist, its recognition is equally the responsibility of the physician.—*New England J. Med.*, 230:9, January 6, 1944.

PAUL H. KEYES.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Cleveland, Ohio, September 11-16.

AMERICAN DENTAL ASSISTANTS ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DENTAL ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DIETETIC ASSOCIATION, Chicago, Ill., October 25-27.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York, N. Y., October 3-5.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second Tuesday in each month, at the Medical Society Auditorium, Washington.

GREAT LAKES SOCIETY OF ORTHODONTISTS, Toledo, Ohio, October 23-24.

MONTREAL DENTAL CLUB ANNUAL FALL CLINIC, October 25-27.

NATIONAL BOARD OF DENTAL EXAMINERS, July 31-August 1.

NATIONAL DENTAL ASSOCIATION, Cleveland, Ohio, August 14-18.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, October 17-19.

OHIO COLLEGE OF DENTAL SURGERY CLASS OF 1919, Cincinnati, June 12.

GREATER NEW YORK DENTAL MEETING, December 4-8.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, November 13-14.

WOMEN'S DENTAL SOCIETY OF NEW YORK, New York, N. Y., September 20 and November 15.

STATE SOCIETIES

June

Maine, at Augusta (16-17)

New Hampshire, at North Conway (25-27)

September

Southern California, at Los Angeles (19-21)

March 1945

Wisconsin (19-21)

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, September 25. Farrar McCrummen, Woodward Bldg., Birmingham, Secretary.

Colorado, at Denver, June 19-24. Ezra E. Schaefer, Republic Bldg., Denver, Secretary.

Connecticut, at Hartford, June 20-24. Clarence G. Brooks, 320 State St., New London, Recorder.

Florida, at Jacksonville, September 18-21. A. W. Kellner, P. O. Box 155, Hollywood, Secretary.

Kentucky, at Louisville, September 12-15. W. F. Walz, 1114 First Nat'l Bank Bldg., Lexington 3, Secretary.

New Jersey, June 26-30. J. Frank Burke, 150 E. State St., Trenton 8, Secretary.

New Mexico, at Santa Fe, June 19. J. J. Clarke, Artesia, Secretary.

North Carolina, at Raleigh, September 25. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota, at Fargo, July 10-13. R. A. Andrews, Carrington, Secretary.

Ohio, at Cleveland, September 11-13, or Columbus, October 9-11 (practical examination for dental candidates); at Columbus, October 12-14 (theory examinations for dental and dental hygiene candidates); at Columbus, October 10 (practical examination for dental hygiene candidates). Earl D. Lowry, 79 E. State St., Columbus, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, June 6-10. Reuben E. V. Miller, 61 N. Third St., Easton, Secretary.

Rhode Island, at Providence, June 6-7. Archie A. Albert, 84 Broad St., Pawtucket, Secretary.

Vermont, at Montpelier, June 26-28. Charles I. Taggart, 139 Bank St., Burlington, Secretary.

West Virginia, at West Liberty, June 26-28 (dental and dental hygiene). R. H. Davis, Goff Bldg., Clarksburg, Secretary.

Wisconsin, at Milwaukee, July 10-14. Stephen F. Donovan, Tomah, Secretary.

Wyoming, at Cheyenne, June 22-26. O. R. Docekal, Sheridan, Secretary.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE American Association for the Advancement of Science will meet in Cleveland, Ohio, September 11-16. The Dental Subsection of the association will present a symposium on dental caries and fluorine September 11.

PAUL C. KITCHIN, *Secretary,*
Subsection on Dentistry,
Ohio State University,
College of Dentistry.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

THE Twentieth Annual Session of the American Dental Assistants Association will be held in Omaha, Nebr., October 9-11. For further information, address

AILEEN M. FERGUSON,
General Secretary,
709 Centre St.,
Jamaica Plain, Mass.

AMERICAN DENTAL ASSOCIATION

THE next annual meeting of the House of Delegates of the American Dental Association will be held in Omaha, Nebr., October 9-11.

HARRY B. PINNEY, *Secretary,*
222 East Superior St.,
Chicago 11, Ill.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

THE twentieth annual meeting of the House of Delegates and the Board of Trustees of the American Dental Hygienists' Association will be held in Omaha, Nebr., October 9-11. Headquarters will be at the Hotel Fontenelle.

A. REBEKAH FISK, *Secretary,*
1704 North Troy St.,
Arlington, Va.

AMERICAN DENTAL SOCIETY OF EUROPE

THE available members of the Executive Committee and officers, viz. J. A. Holden, H. S. Hargreaves (formerly of Paris), C. W. Roberts, R. N. LeCron, Sidney McCallin, W. A. Porter, W. H. McNally, M. H. G. Sturridge and K. C. Campbell, met January 21 in London, under the chairmanship of the president, Dr. Holden, to discuss the future plans of the society. It was decided to hold a "get-together" dinner of all the members now residing in Great Britain some time during the summer.

K. C. CAMPBELL,
Honorable Secretary,
88 Portland Place,
London, W. 1.

AMERICAN DIETETIC ASSOCIATION

THE annual meeting of the American Dietetic Association will be held at the Palmer House, Chicago, Ill., October 25-27. The sessions will be devoted to discussion of plans and problems relating to food and nutrition in connection with the war. Topics will include progress of the acceleration program to increase the number of qualified dietitians; improvement in methods in teaching student nurses; recruitment of dietitians for the Army; administrative food problems; newer developments in diet therapy; maternal and child nutrition; school lunch problems; rationing and food supplies; labor policies in food service units, and technology of foods. There will also be discussions of postwar plans and the extent to which the association and its members can participate. Details of the program will be released as they develop.

AMERICAN PUBLIC HEALTH ASSOCIATION

THE Executive Board of the American Public Health Association announces the Second Wartime Public Health Conference and the seventy-third annual business meeting in New York, N. Y., October 3-5. Meetings of related organizations will take place October 2. Headquarters, Hotel Pennsylvania. The scientific program will be devoted to wartime emergency matters as they affect public health. The chairman of the Local Committee in Charge of Arrangements is Ernest L. Stebbins, M.D., health commissioner of New York City. The chairman of the program committee is Reginald M. Atwater, M.D.

WILLIMINA RAYNE WALSH,
Associate Secretary,
1790 Broadway,
New York 19, N. Y.

DISTRICT OF COLUMBIA DENTAL SOCIETY

THE District of Columbia Dental Society holds its meetings on the second Tuesday of every month, at the Medical Society Auditorium, 1718 M. St., N.W., Washington.

J. WALTER BERNHARD, *Secretary,*
1835 Eye St., N.W.,
Washington.

GREAT LAKES SOCIETY OF ORTHODONTISTS

THE next meeting of the Great Lakes Society of Orthodontists will be held Ooctober 23-24 at the Commodore Perry Hotel, Toledo, Ohio.

C. EDWARD MARTINEK, *Secretary,*
661 Fisher Bldg.,
Rochester, N. Y.

MONTREAL DENTAL CLUB ANNUAL FALL CLINIC

THE twentieth anniversary meeting of the Montreal Dental Club Annual Fall Clinic will be held October 25-27 at the Mount Royal Hotel, Montreal. For further information, apply to

M. L. DONIGAN, *Director,*
Drummond Medical Bldg.,
Montreal, Canada.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next two sessions for the examination of candidates in Parts 1 and 2, July 31-August 1 in schools where there are five or more candidates. For further information, address

GORDON L. TEALL, *Secretary,*
Box 71,
Hiawatha, Kan.

NATIONAL DENTAL ASSOCIATION

THE National Dental Association will hold its thirtieth annual session August 14-18 at the New Central High School, Cleveland, Ohio. For further information, address

J. A. JACKSON, *Secretary,*
Charlottesville, Va.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

THE Odontological Society of Western Pennsylvania will hold its annual meeting at the William Penn Hotel, Pittsburgh, October 17-19.

W. EARLE CRAIG, *Secretary,*
Suite 206, Jenkins Bldg.,
Pittsburgh, 22.

OHIO COLLEGE OF DENTAL SURGERY CLASS OF 1919

THE Class of 1919 of the Ohio College of Dental Surgery will hold a reunion (twenty-fifth year) June 12 at the Netherland Plaza Hotel, Cincinnati.

F. W. LONG,
First National Bank Bldg.,
Norwood.

GREATER NEW YORK DENTAL MEETING

THE Greater New York Dental Meeting will be held at the Hotel Pennsylvania, New York, December 4-8.

WILLARD S. BELL, *Chairman,*
Press and Publication Committee,
Room 106A, Hotel Pennsylvania,
New York.

NEW YORK SOCIETY OF ORTHODONTISTS

THE next meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, November 13-14.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead.

WOMEN'S DENTAL SOCIETY OF NEW YORK

THE next meeting of the Women's Dental Society of New York will be held September 20 at the Pennsylvania Hotel at 8 p.m. Carlton Frederichs will speak on "Victuals, Vitamins and Victory."

MATHILDE FREUND, *Chairman,*
Publicity Committee,
Scarsdale.

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE annual meeting of the Southern California State Dental Association will be held at the Biltmore Hotel, Los Angeles, September 19-21.

ROBERT L. BORLAND, *Secretary,*
756 S. Broadway,
Los Angeles 14.

MAINE DENTAL SOCIETY

THE next annual meeting of the Maine Dental Association will be held June 16-17 at the State House, Augusta.

LAURENCE G. HIGGINS,
Ellsworth.

NEW HAMPSHIRE DENTAL SOCIETY

THE next meeting of the New Hampshire Dental Society will be held June 25-27 at the Eastern Slope Inn, North Conway.

F. E. WILLIAMS, *Secretary*,
814 Elm St.,
Manchester.

WISCONSIN STATE DENTAL SOCIETY

THE 1945 meeting of the Wisconsin State Dental Society, the Diamond Jubilee, will be held March 19-21, 1945.

BOARD OF DENTAL EXAMINERS OF ALABAMA

THE Board of Dental Examiners of Alabama will conduct its next dental examination beginning September 25 at Birmingham. Credentials and fees must be in the hands of the secretary two weeks in advance of the examination. For application blanks and further information, address

FARRAR MCCRUMMEN, *Secretary*,
1005-1006 Woodward Bldg.,
Birmingham.

COLORADO STATE BOARD OF DENTAL EXAMINERS

THE Colorado State Board of Dental Examiners will hold its next examination in Denver June 19-24. All credentials and fees must be filed with the secretary at least two weeks before the examination.

EZRA E. SCHAEFER, *Secretary*,
606 Republic Bldg.,
Denver.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, June 20-24, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

CLARENCE G. BROOKS, *Recorder*,
302 State St.,
New London.

FLORIDA STATE BOARD OF DENTAL EXAMINERS

THE Florida State Board of Dental Examiners will hold its next examination of applicants for license to practice dentistry or dental hygiene in Florida at Jacksonville in the Seminole Hotel, September 18-21. Dental candidates must file preliminary applications by July 18. Final applications for dental and dental hygiene candidates must be complete by August 18. Address all communications to

A. W. KELLNER, *Secretary*,
P. O. Box 155,
Hollywood.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Kentucky State Board of Dental Examiners will be held September 12-15 at the University of Louisville Dental School, Louisville. Dentists graduated prior to 1944 must file applications, complete with full information requested, at this office not later than July 12. Applications of 1944 graduates must be in this office by August 12. Dental hygienists must have completed a two-year course and their applications must be filed before August 12. For application forms and further information, address

W. F. WALZ, *Secretary*,
1114 First Nat'l Bank Bldg.,
Lexington 3.

STATE OF NEW JERSEY BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its next regular examinations commencing June 26 and continuing for four days. On application to the secretary, a copy of the requirements and rules, instruction sheet and preliminary application will be sent. Candidates must file preliminary application blank, together with the fee of $25, on or before April 1. Future schedules will be announced.

J. FRANK BURKE, *Acting Secretary*,
150 E. State St.,
Trenton 8.

NEW MEXICO BOARD OF DENTAL EXAMINERS

THE next meeting of the New Mexico

Board of Dental Examiners will be held at Santa Fe, beginning June 19. Applications must be filed with the secretary ten days before the examination. For application blanks and further information, address

J. J. CLARKE, *Secretary,*
Artesia.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the North Carolina State Board of Dental Examiners for the examination of applicants for licensure will be held at the State Capitol, Raleigh, beginning September 25. Applications must be filed with the secretary thirty days before the examination. For application blanks and further information, address

WILBERT JACKSON, *Secretary,*
Rich Bldg.,
Clinton.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination at the Gardner Hotel, Fargo, July 10-13. Applications should be in the hands of the secretary ten days earlier. For further information and application, address

R. A. ANDREWS, *Secretary,*
Carrington.

OHIO STATE DENTAL BOARD

THE practical examination of the Ohio State Dental Board will be held at Western Reserve University School of Dentistry, Cleveland, September 11-13 and at Ohio State University College of Dentistry, Columbus, October 9-11. The practical examination may be taken either in Cleveland or in Columbus provided due notice is given to the secretary. The practical examination for dental hygiene candidates will be held October 10 at Ohio State University College of Dentistry, Columbus. The theory examination for both dental and dental hygiene applicants will be held in Columbus, October 12-14. All applications for these examinations must be in the hands of the secretary not later than September 28 and no application will be accepted after that date. For further information, apply to

EARL D. LOWRY, *Secretary,*
79 E. State St.,
Columbus.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will meet in Philadelphia and Pittsburgh to examine applicants for licensure to practice dentistry June 6-10. For further information and application blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg.

REUBEN E. V. MILLER, *Secretary,*
61 N. Third St.,
Easton.

RHODE ISLAND BOARD OF EXAMINERS IN DENTISTRY

THE Rhode Island State Board of Dental Examiners will hold its next examination at the Joseph Samuels Dental Clinic in Providence, June 6-7. Application with necessary fee must be in the hands of Mr. Thomas Casey, Chief, Division of Examiners, Room 366, State Office Bldg., Providence, fifteen days before the examination.

ARCHIE A. ALBERT, *Secretary,*
84 Broad St.,
Pawtucket.

STATE OF VERMONT BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet at the State House, Montpelier, June 26-28, for the purpose of examining candidates for license to practice in the State of Vermont. Address all inquiries to

CHARLES I. TAGGART, *Secretary,*
139 Bank St.,
Burlington.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the West Virginia State Board of Dental Examiners will be held at West Liberty State College, West Liberty, June 26-28. Examinations for licensure of dentists and dental hygienists will be held. All applications must be in the office of the secretary by June 16.

R. H. DAVIS, *Secretary,*
Goff Bldg.,
Clarksburg.

WISCONSIN STATE BOARD OF DENTAL EXAMINERS

THE Wisconsin State Board of Dental Examiners will hold its next examination July 10-14 at Marquette Dental School, Milwaukee, for licensure in dentistry or dental hygiene. For applications and other information, address

STEPHEN F. DONOVAN, *Secretary,*
Tomah.

WYOMING STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Wyoming Board of Dental Examiners will be held in Cheyenne June 22-26. All applications are required to be in the hands of the secretary two weeks prior to the meeting of the board.

O. R. DOCEKAL, *Secretary,*
Sheridan.

ALPHA OMEGA

ALL Massachusetts members of Alpha Omega in service, both in this country and abroad, are requested to communicate with Abraham Gurvitz, War Service Committee, Alpha Omega Fraternity, 371 Commonwealth Ave., Boston 15, Mass.

SAMUEL S. HIRSON, *Secretary,*
Boston Alumni Chapter,
471 Commonwealth Ave.,
Boston, Mass.

PAN AMERICAN ODONTOLOGICAL ASSOCIATION SCHOLARSHIP

THE Pan American Odontological Association takes pleasure in announcing an annual scholarship at the Tufts College Dental School, Boston, Mass., for graduate dentists from any of the Latin American countries. The subjects of study include: complete denture prosthesis, partial denture prosthesis, minor oral surgery, operative dentistry, ceramics, children's dentistry, root surgery and radiology, preventive dentistry and treatment of parodontal diseases.

This annual scholarship is an addition to the already available Pan American Odontological Association scholarships at the New York University, College of Dentistry; Evans Dental Institute, School of Dentistry, University of Pennsylvania, and the W. K. Kellogg Foundation Institute, Graduate and Postgraduate Dentistry, University of Michigan.

RALPH HOWARD BRODSKY, D.M.D.,
Executive Secretary,
14 East 81st St.,
New York 28, N. Y.

RESIDENCIES IN DENTISTRY

THERE will be available July 1 two full-year residencies in dentistry at the Sea View Hospital, Staten Island, New York, N. Y., each with a stipend of $1,200 annually plus maintenance. Sea View Hospital, probably the largest tuberculosis hospital in the world, offers unusual facilities in the various phases of dentistry. Those interested should communicate with

RALPH HOWARD BRODSKY, *Director,*
Division of Oral Surgery,
14 East 81st St.,
New York 28, N. Y.

INTERNSHIP AND VOLUNTEER EXTERNSHIPS

THERE is an internship, as well as several volunteer externships, available for recent graduates in the Dental Department of the Bronx Hospital. Opportunity is offered for training and experience in oral surgery and exodontia, orthodontia, periodontia, endodontia (root-canal therapy) and operative dentistry. Application forms can be obtained by communicating with S. Berton Gerstner, Director, Dental Department, Bronx Hospital, Fulton Ave. at 169th St., Bronx 56, N. Y.

DENTAL INTERNSHIPS

Two internships are available at the St. Louis City Hospital for recent dental graduates. Opportunity is afforded for training and experience in dental and oral surgery, diagnosis and other phases of dentistry. Applicants should address Leo J. Wade, Medical Director, or Hamilton B. G. Robinson, D.D.S., City Hospital, 1515 Lafayette Ave., St. Louis, Mo.

DENTAL INTERNSHIPS

THE Greater New York Conference of Hospital Dental Services, comprised of a group of men who are chiefs of dental services, would like to aid those men seeking dental internships in hospitals in the metro-

politan area. Those who are not in the Army or the Navy and who are desirous of obtaining internships should communicate with

MARY E. REILLY, *Secretary,*
386 Fourth Ave,,
New York, N. Y.

DENTAL INTERNSHIP

AN internship is available to a recent dental graduate at the Research and Educational Hospital of the University of Illinois Medical Center. An unusual opportunity is afforded for training and experience in hospital dentistry and the medical aspects of dental disease. Application forms can be obtained from the Dean, University of Illinois College of Dentistry, 808 South Wood St., Chicago 12, Ill.

DENTAL EXTERNSHIPS

VOLUNTEER dental externships are available in the Research and Educational Hospital to dental practitioners desiring training and experience in hospital dentistry, dentistry for children and the dental aspects of systemic disease. Application forms can be obtained from the Dean, University of Illinois College of Dentistry, 808 South Wood St., Chicago 12, Ill.

UNIVERSITY OF CALIFORNIA RESEARCH ASSISTANT

THE College of Dentistry, University of California has an appointment as research assistant available for a qualified person beginning June 30. The appointment is in the Division of Dental Medicine and is for one year. This may be extended for an additional year.

This appointment is designed primarily for dental graduates with an interest in dental research and teaching. However, this dental degree requirement can be waived if other qualifications justify it.

The basic salary is $1,500 a year, plus an emergency increase to care for added living costs.

Application forms can be obtained from the Dean of the College of Dentistry, University of California, San Francisco, Calif.

WILLARD C. FLEMING, *Dean.*

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid in dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, according to his interests, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduates Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
Rochester, N. Y.

OHIO STATE UNIVERSITY POSTGRADUATE COURSES IN DENTISTRY

THE College of Dentistry of the Ohio State University, at Columbus, offers postgraduate courses in dentistry that are especially designed for the general practitioner who may wish to amplify his training in any of the following fields: oral surgery, prosthodontia, radiology, crown and bridgework, operative dentistry and root-canal therapy. The length and dates of the courses are as follows:

Oral surgery	June 12 to 16
Prosthodontia	June 12 to 17
Crown and bridge	June 12 to 16
Operative dentistry	June 12 to 16
Root canal therapy	June 12 to 16
Radiology	June 19 to 23

The fees for these courses will be $50 a week, with the registration limited to ten in

each course, with the exception of prosthodontia, which will be $100 for the week's course, with registration limited to five.

It is the aim of these courses to teach new technics as well as to review the fundamentals. Further information and application blanks can be secured from the office of the dean, College of Dentistry, Ohio State University, Columbus.

FEDERAL POSITIONS FOR DENTAL HYGIENISTS

THE United States Civil Service Commission is continuing to recruit dental hygienists for federal positions. Experience is no longer necessary.

Completion of a full course leading to graduation from a recognized school of oral hygiene and registration as a dental or oral hygienist in a state, territory or the District of Columbia will qualify applicants. Students enrolled in schools of oral hygiene may apply for federal positions when they are within nine months of completion of the course and may enter on duty on completion and registration. There are no age limits for the positions and no written tests. Appointees receive $1,970 a year entrance salary, which incorporates compensation for the eight hours of overtime included in the present forty-eight hour federal work week. The majority of positions are in Army hospitals and dispensaries throughout the country, particularly in the West and Southwest. Vacancies may occur also in the Veterans Administration and the Public Health Service. Applications should be filed with the Civil Service Commission, Washington, 25, D. C.

W. C. HULL, *Executive Assistant,*
United States Civil Service Commission,
Washington, D. C.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING MARCH AND APRIL 1944

March 7

2,343,620, OSCAR H. PIEPER. Equipment stand.

2,343,651, GEORGE T. FIELDING. Cleansing and polishing medium for dentifrices or the like.

2,343,777, ALBERT FRANCIS LAYS. Artificial teeth selection rim.

March 14

D-137,434, ROBERT C. ANGELL. Design for a folding dental chair.

D-137,450, CLARENCE LAVERNE FAIRBANKS. Design for a dental floss holder.

March 21

2,344,695, GILBERT H. DROEGKAMP. Dental tool.

March 28

2,345,211, ROBERT NEIMAN. Investment composition.

2,345,255, CHARLES VICTOR GROSS. Dental impression compound.

2,345,301, ARTHUR E. SMITH. Syringe and ampoule.

2,345,305, HENRY M. THORNTON. Method of forming artificial teeth.

April 11

D-137,641, JOHN F. BROWN. Design for a dental plate brush.

April 18

2,346,725, NETTY BUTZKE. Sterilizing container for syringe and hypodermic needles.

April 25

2,347,179, HORACE P. GORMAN. Attachment for hypodermic syringes.

2,347,340, HARRY M. SMALLEN. Partial removable denture.

2,347,553, JOHN L. GOTHERS. Method of and and apparatus for performing dental operations.

2,347,554, JOHN L. GOTHERS. Vibrator apparatus.

2,347,567, EDWARD J. KRESSE. Dental implant.